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GAS JOURNAL

LIGHT • HEAT • POWER • BYE-PRODUCTS

[Founded in 1849 as the "Journal of Gas Lighting."]

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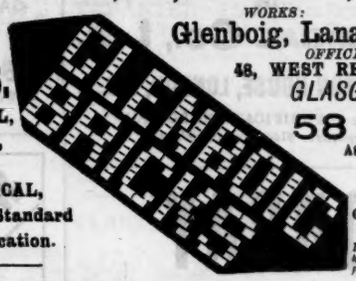

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EDITORIAL NOTES.

Good Value and Financial Support.

PERUSING the report of the speech that the President (Mr. D. Milne Watson) made at the annual meeting of the National Gas Council on Wednesday last, we leave it with the feeling that it is a remarkable record of good solid work accomplished—work which will have enormous influence on the fortunes of the industry in time to come. There has never been in the whole history of the industry a single year in which so much has been concentrated that affects its interests. There was work which has rescued it from its struggles with throttling adversity, work which has been constructive, and work which will allow it to divest itself of many impediments which have been hung about it in the past through knowledge falling short of that which exists at the present time. It is only when a survey of the total work is made concisely and comprehensively, as was done by the President, that one gets a real mental grip of what it has all meant. Men deal with and consider matters as they arise; but those who have not the actual work to do, and have only to sit still and enjoy the benefits —the relief, the opportunities, the new liberties, or whatever may be the nature of the issue of the work—rarely think of, or try to assess the value of, what it all means *en bloc*. There is expanse in what the President said; and in it good variety, solidity, and importance. Every item in the speech told of things that promote and defend the interests of the industry, which things could never have been approached, much less accomplished, had the industry not been in corporate state. There are the Gas Regulation Act, the Public Utility (Capital Issues) Act, the Corporation tax, the Great Northern Railway Act, the coal problem, and the prices of spent oxide and sulphuric acid; and these are but prominent among almost countless matters that have passed under the consideration of and treatment by the Central Executive Board and the diligent officers of the Council. The year's work has brightened the industry's outlook, and doubt has been superseded by confidence.

What would have been the position of the industry to-day if there had been no National Gas Council to champion its cause, to watch over its interests, and to operate where operation in the political regions was necessary, and where individual concerns could not have obtained the same hearing or had the same influence? We cannot conceive. But of this we have a fair amount of confidence—that nothing but persistence and hard work, buoyed-up and encouraged by the knowledge that an industry powerful in its unity stood behind, have succeeded in giving gas undertakings the brighter outlook than they had twelve months ago, while a more hopeless state might in other circumstances have well existed now. Just think. To-day we have in our possession a legislative enactment constructive and relieving. By the simple means provided by it, new powers and relief are obtainable. Without an effective representative organization, gas undertakings might have been individually struggling along, spending money all the way, in trying to get through Parliament and Select Committees (and in face of considerable opposition, with all the perils attaching to decision by various Committees), the powers to re-establish themselves. The road now and for all time has been made easier. But there are still difficulties ahead; and we do not know what is lying concealed in the future with competition, and with contemporary development of organization in all industries, trades, and directions. The gas industry must have prosecuting power and resisting power—maintained at the highest efficiency and in the most effective form. "Effective form" embraces vitality and financial strength. It cannot afford to shed any part of its active organizations; it cannot afford to enervate its corporate power in any way. That would be folly; the result disastrous.

There are three parts of gas organization the operations of which must not be impaired, but must be strengthened in the circumstances of the times. We have said enough to show that the industry must maintain an effective organization to deal with its political work. Such an organization we have in the National Gas Council, in which are combined—working in harmony and bringing influences of different orders to bear upon the common causes of the industry—both forms of gas-works ownership. There is next the publicity work of the industry, which is in the keeping of that capable organization, the British Commercial Gas Association. What are its claims? There is change all about us. The gas industry is going to develop on a heat-unit basis. That alone is sufficient reason for maintaining the Association in a position to give its maximum possible activity. But there are several other reasons; not the least important among which is that the electrical industry has its Electrical Development Association doing for electricity what our "B.C.G.A." does for gas. The publicity branch of gas organization cannot be abandoned. And necessary to both the National Gas Council and the British Commercial Gas Association—necessary to technical progress in gas production and utilization—is scientific research, which is carried on through the Institution of Gas Engineers. To research we owe much of the information that helped the National Gas Council in the many conferences and negotiations preceding the passing of the Gas Regulation Act. To finance this triple work, subscriptions have hitherto been paid amounting to 2s. 6d. per million cubic feet of gas production for the publicity and research work, and 1s. upon the same basis for carrying on the work of the National Gas Council—together 3s. 6d. The ratio of costs to work has changed—for the worse; and yet developments both internal and external to the industry demand more work to be done. It cannot be done without money. The National Gas Council are now proposing that the scale of a joint contribution shall be 5s. per million cubic feet of output, which means only 0·06d. per 1000 c.ft., or, for a concern with a declared calorific value of 475 B.Th.U., 0·0126d. per therm. For the mass of political, propaganda, and research work that is done, the new joint subscription is modest indeed. The proposal, it is understood, is that the National Gas Council should hand over something like 3s. 4d. of the 5s. to the British Commercial Gas Association, and retain 1s. 8d., out of which to pay for the work that falls within the province of the Council, while from the same source grants for research work will be annually made in varying amount according to requirement to the Institution of Gas Engineers. The 5s. is none too much.

There are critics. There are bound to be. Hardly a thing has ever been done that has not had its critics. There are some who live in the past, and not in the new present. Some who assess by old standards, and not by the new. Some who forget that old conditions are dead, and new ones are here. The gas industry has a large capital, and large interests in numerous directions. For gas undertakings to spend jointly £50,000 a year in promoting and defending that capital and interests, and in achieving new development, is relatively moderate—extremely moderate, as is seen when reduced to per 1000 c.ft. or per therm. Compare it with the sum the electricity industry has to spend in financing the Electricity Commissioners; compare it with what the transport interests have to pay for the Ministry of Transport. Those are compulsory payments. By contrast

the joint subscription proposal sinks into insignificance. But yet there are critics—critics of an industrial necessity. We must think industrially. Organizations cannot work without money, any more than retorts can produce gas without the raw material. The industry is through its organization now in a consolidated position. It must not drift apart again as units without any objective, nothing in common, and no united ambition. It has gained liberties of a no mean order. It must not sacrifice what has been gained by making a mistake, or by insufficient appreciation of what is necessary to its well-being.

The Tully Auxiliary.

THE paper that Mr. Henry Rule, of Kelty, recently read before the Eastern District of the Scottish Junior Gas Association is valuable, in that it gives better perhaps than any previous publication has done some actual results, with analyses, of the gas produced by a Tully plant, as well as of the mixed gas. Of course, this plant is not always used as an auxiliary, though we have so termed it in the heading. In some small works to-day, it is the only means of gas production; and its services have been their salvation in these days of enormous hardships for gas-works not affluent and generally not generously situated. But in the larger works, its present part is as an auxiliary. What the position of it or its like may be in the future, we may leave time to tell us. Everything must have a start; and we are only just beginning to learn or appreciate how to make therms in the most economical manner for sale at the lowest price. In every locality conditions vary, and affect consideration and determination. The results that Mr. Rule gives must not, however, be taken to express the economic limits of the plant, nor of ultimate achievement in respect of mixed gas. He himself has confidence that, when he is able to work the plant continuously, he will be able to improve on the results so far achieved; and as to the mixed gas, the production of gas from his horizontal retorts, being round about 10,000 c.ft. per ton of 530 to 540 B.Th.U. from the coal he uses, does not make the best showing in B.Th.U. per ton of total coal employed in the two processes. Regard must be had to the conditions of working at Kelty in assessing the results. What is of value is that, subject to these conditions, the results are reliable.

The Tully plant at Kelty has a capacity of 150,000 c.ft. per day, or, roughly speaking, 50,000 c.ft. per eight-hour shift; and this latter figure is the production that is being sent out per day in a total make of 155,000 c.ft. of mixed gas. Mr. Rule states the considerations that led him to adopt the plant in his particular circumstances. The considerations may be summarized as being, in relation to the therms produced, low costs for capital, maintenance, labour and coal, small space, and the ability to boost-up supply rapidly. In relation to production, he told his audience and informs his readers that the saving in wages per annum alone (a single attendant can do all the work required in an eight-hour shift) will pay 10 p.ct. on the cost of the plant. Relatively to his ordinary working with horizontal retorts, the economies look like paying handsomely for the plant. The process is simple in working; and the exercise of ordinary intelligence will ensure uniform results. It is only a matter of intelligent regulation—for example, of steam as the run proceeds and the temperature in the generator diminishes; otherwise, naturally, there will not be proper decomposition of the steam. If the conditions that he sets forth are complied with, there is not the slightest difficulty in keeping the CO_2 content of the gas at a fairly constant level. Of course, the quality of the coal used makes a considerable difference to the production and the labour entailed. The coal chiefly used at Kelty is washed doubles non-coking of (as the analysis shows) good characteristics, one of which is that the ash is only 4·18 p.ct. With such coal, apart from its suitability for gas-making, the work of clinkering is rendered easy, and this assists in keeping the maintenance costs low. This is read into the remark in the paper: "I "carefully examined the brickwork of the generator and "retort, and found it was almost as good as on the day it "was first started to work, over six months ago."

As to the results. The Tully gas made under Kelty conditions is of 330 B.Th.U., and the make is 46,744 c.ft. per ton, which works out to 15,425,520 B.Th.U., or three times more B.Th.U. than are made per ton in the horizontal settings. The coal gas in the mixture we make out is of 537 B.Th.U., and the mixed gas consists approximately of two-thirds coal gas and one-third Tully gas—the mixture representing 12,250 c.ft. of 470 B.Th.U. gas per ton, or a total of 5,757,500 B.Th.U. On the basis of therms, the mixed gas only shows an advantage over Kelty coal gas of about 4 therms per ton of coal. The therm figures per ton must not, however, be considered alone. The true test is the financial economy in every direction—capital, labour, and coal, less the value of the secondary products lost in producing the one-third part of Tully gas—which is realized in securing the therm value, and which enables the mixed gas to be sold per therm at a lower price than would be the case by the production of neat coal gas. It is on this point of financial economies that the paper only gives indications, and not actual results. There is, however, sufficient in the indications to show that advantage is realized, seeing that the Tully plant gives three times more therms per ton than the horizontal coal-gas plant, with lower costs.

We are glad to see the analyses in the paper; and in these Dr. Lessing has been concerned, so that their accuracy is vouched for. It is interesting to observe the low inert content of the Tully gas—about 12 p.ct.; but this is increased to 17·7 p.ct. in the mixed gas. It is not difficult to see how the increase arises, inasmuch as the mixed gas contains 1·8 p.ct. of oxygen. The purifiers are small in relation to the work they have to do, and so more air than would otherwise be the case has to be admitted. It is noted, too, that the carbon monoxide in the diluent gas is 36 to 38 p.ct.; but this is reduced to 16·5 p.ct. in the mixed gas. The information as to the distribution of the lower quality gas is also interesting. Between former times and now, there has been a reduction of 70 B.Th.U. per cubic foot—from 540 to 470 B.Th.U. But there has been little adjustment required of the consumers' appliances. Mr. Rule adopted the prudent course of not effecting the change in calorific value in one stride, but allowing it to descend by easy gradations.

The Effect upon Distribution of Changes in Gas Demand.

WHEN Mr. Stephen Lacey, the Chief Distributing Engineer of the Gas Light and Coke Company, consented to read a paper before the London and Southern Junior Association, which paper he modestly calls "Notes on Gas Distribution, "with Special Reference to the Gas Light and Coke Com- "pany," he made a promise which has resulted in the contribution of something to the records of the Association that will become notable in gas distribution literature, and will give a lead to thought of no small importance in these days when there is a good deal of crude hypothesis in the air as to what is going to happen to gas distributing systems when, under the heat-unit system, more economical production of heat units will call for the making of a gas of lower B.Th.U. content per cubic foot. This is an aspect of the matter to which Mr. Lacey did not particularly direct attention; but what he did say will tend to the alleviation of the worst fears of those who view with some amount of perturbation the future of requirement in this respect In the paper, Mr. Lacey has subjected the distribution experiences of the Gas Light and Coke Company over three decennial periods to an analytical investigation, and has drawn conclusions from what he finds. It may be that these conclusions would not apply any more than generally to other undertakings, because no other undertaking has an area with precisely corresponding characteristics, nor probably with an equal balance in the diversity of demand taking the area through and through. This fact invests the paper with all the more interest, for the arithmetical workings and curves supply something which other investigators along the same lines may adopt as (shall we so express it?) standard; and Mr. Lacey's lucid description of the methods adopted in his research will enable the official responsible for distribution in every area to work out its position in the same respects and so ascertain how near it approximates to that of the Gas Light and Coke Company. There is both novelty and good reason in the methods; for, as Mr. Lacey says, he is not aware (nor are we) that any analysis has been made to determine the extent to which the industry has benefited by the greater uniformity in the rate of gas delivery, or that the bearing of the matter upon present-day developments in the manufacture and sale of gas has been fully considered.

The developments of the past thirty years in gas utilization have had a remarkable levelling-up effect upon the

load of gas undertakings, or, to put it in Mr. Lacey's own words, in increasing the ratio of the average to maximum delivery. This process of levelling-up has been not only due to the incoming of new business at different parts of the day, but (though to a smaller extent) to the bringing down of the high peak load that existed for a few hours in the days of flat-flame lighting. Supposing the incandescent gas-burner and electric lighting had not come along, the problems of gas distribution for a comparatively brief period of the twenty-four hours would in some districts have been much worse than they are to-day, when through the coming of gas cooking, heating (domestic and industrial), power, water heating, and the almost countless smaller applications of the fluid fuel, a larger total business is done, with a better utilization of the distribution system. The developments, in short, have produced a higher distribution efficiency, and therefore economy. Considerably more business has been done through distribution systems of which large parts were originally laid for the conveyance of gas for lighting only. The figures in the paper commence with 1889; and they take ten-year stages to 1919. In 1889, incandescent lighting was in its infancy, and so were cooking and heating by gas. Comparable days in regard to weather have been picked out by Mr. Lacey; and to show the significance of change as between days in summer and in winter—distinct from the levelling-up that there has been in the load during different hours of the day—let us quote four of the figures. On Dec. 30, 1889, the gas delivery in the Company's area was 115·8 million cubic feet; and on Dec. 9, 1919, it was 137·5 million cubic feet—an increase of 18·7 p.ct. between the consumptions of two days thirty years apart. Comparable days in summer were June 26, 1889, and July 9, 1919. On these days the deliveries were respectively 29,100,000 and 74,000,000 c.ft.—an increase of 44,900,000 c.ft., or 154 p.ct. The summer day's consumption in 1889 was only 25 p.ct. of the winter day's consumption; while the summer day's consumption in 1919 was 53·8 p.ct. of the winter day's consumption. These are figures which tell not only of the growing consolidation of the gas-supply business (so valuable to efficiency and economy), but of the compensation there has been for the change from flat flames to incandescent lighting, and for the passing over to electricity of the patronage of part of former consumers of gas for lighting. Some portion of the difference would be due to the amalgamations with the Gas Light and Coke Company of the businesses of the West Ham, Barking, and Chigwell Gas Companies, and to the reduction in the calorific value of the gas. But these disturbances in the comparison are not of such importance as to negative the indications of good progress to a greater uniformity in delivery.

Then taking the curve for a typical winter day. It shows the well-marked breakfast and dinner cooking loads; and the rate of delivery is so nearly uniform from early morning until late in the evening that, in Mr. Lacey's view, no further improvement in the form of the curve can be hoped for. The same thing applies to a typical summer day, which illustrates the disappearance of the summer lighting load brought about by "daylight saving," and also the remarkable increase in the industrial and cooking loads. Another lesson of the curves is the diminution since the beginning of the century of the difference between a maximum and a typical winter's day. This is in part attributable to the reduction in the intensity of London fogs—a reduction chiefly due to the increased use of gas and coke in place of coal. A fog has less effect now than formerly upon gas demand; but a fall in temperature has now greater effect. All this shows a healthy condition of progress. It also suggests another point bearing upon the supply, under the heat-unit basis, of gas of a lower calorific value per cubic foot. The development of gas heating—speaking generally, and not of exceptional cases—will make its greatest claims during the hours of daylight, when the distribution systems of gas undertakings have, as a rule, a margin of capacity, except perhaps in residential areas during the maximum demand for cooking, which maximum is generally a Sunday experience, when industrial and shop demands are closed-down. Of course, there are some localities in gas areas where pressures are very poor owing to a deficiency in carrying capacity; but they anyway would have to receive attention under the new statutory prescription as to maintaining a pressure of 2 inches in the mains. Transmission and boosting at higher pressures are mentioned towards the end of the paper.

We have Mr. Lacey also supplying us with something new in the nature of a standard of measurement for the delivery of gas through mains—something (as he puts it) comparable with the electrician's load factor. He adopts as a measure of duty that can be obtained from mains the ratio of the average rate of delivery to the maximum rate. He calls this ratio the "distribution load factor"—expressing the rates of delivery in cubic feet per hour, and obtaining the average rate by dividing the gas made per annum by the number of hours in the year. In considering what is said in the paper in this connection, it must be borne in mind that this is only an average distribution factor, and that it applies to the Gas Light and Coke Company. In this part of the paper, one finds a considerable amount of interest. There is seen a gradual improvement in the percentage increase in load factor over every ten years since 1889. A notable thing is that the maximum hourly delivery in 1919 is exactly the same as in 1889—viz., 9·8 million cubic feet per hour. It will be remarked, too, that the percentage increase in the gas delivered per annum and the corresponding increase in the "distribution load factor" are also the same—72 p.ct. It follows that if the distribution load factor shown (which is an average of the distribution system as a whole) were applicable to any and every part of the system, the distribution system of 1889 would have been capable of dealing with the whole increase (72 p.ct.) in the total gas delivered without increase in the maximum losses of pressure throughout the system. Local distribution factors, however, are different from the average for the whole system. Those who would essay to criticize the conclusions in the paper (drawn from averages of the whole system) must bear in mind that the author fully acknowledges the existence of regional deficiencies (hidden by the law of averages) which need rectifying in many areas, and which are the bane of many gas salesmen. But dealing with the average of the whole district of the Gas Light Company, the tables show there has been a levelling-up of the hourly rate of delivery through a winter day; there has been a levelling-up of the daily rate of delivery throughout a week; and there has been a levelling-up of the weekly rate of delivery throughout the year.

All this indicates the great change that has been made for the better in the conditions of gas supply through the diversity of demand, which has narrowed the differences between the hourly, daily, or seasonal minimum and maximum demand. It is obvious that this levelling-up and more efficient use of the mains has had a beneficial effect on distribution and storage capital costs per unit of delivery. The manufacturing load factor for the Company has also increased since the beginning of the century by 22 p.ct.; and it follows that the annual effective capacity of a unit of works plant has been increased by the same percentage. All this shows what the revolution in demand has brought about to the benefit of efficiency and of capital cost. But Mr. Lacey does not view with any great degree of happiness the differences which the new housing estates, with fewer houses to the acre, and expensive mains and services, are going to introduce in the matter of distribution capital costs; and, to minimize the effects, it will be necessary to obtain from these estates the largest possible part of the consumption potentiality. Some alleviation too may be realized from old-established areas in which the mains are less severely taxed than they were thirty years ago, owing to the changes in demand. Every effort should be made to procure additional consumption where there is a margin of main capacity.

This paper by Mr. Lacey is an informative and suggestive one. It deals with facts drawn from the records of the Gas Light and Coke Company, and with calculations made from those facts. Its lessons have previously been in mind in perhaps somewhat shadowy form, but here we have them presented in well-defined shape—always in considering them bearing in mind that the deductions are from the averages obtained from the whole of an extensive system.

Christmas and the New Year.

All good wishes for Christmas and the New Year to our readers and all with whom the "JOURNAL" has business relations.

Orders and Inquiries.

So far, we have not heard that any inquiries have been fixed in connection with the applications for Orders under section 1 of

the Gas Regulation Act. One may surmise from this that the Board of Trade have not yet received any such serious objections that they cannot be dealt with by correspondence or conference. Anyway, it is not likely that, if inquiries are necessary, there will be any now before the New Year.

Railway Companies and Pressure.

During the progress of the Gas Regulation Bill through Parliament, the railway companies did not miss a single opportunity for pressing their claims for preferential consideration in regard to pressure. In Standing Committee "A," they endeavoured to carry an amendment which provided, among other things, that "the relation of the calorific power of the gas supplied to the pressure of supply, as measured at the inlet of the consumer's meter, shall be such that the product of the multiplication of the number of thermal units by the number of tenths of an inch of pressure shall at no time be less than 10,000." The author of this foolish formula deserves all the ridicule that can be imposed on him. As has been said before, it is not only prejudicial to the interests of the gas industry, but it is unscientific. We will not examine the details of the suggestion, because it is now understood that the railway companies are lodging practically identical representations regarding pressure in relation to calorific value in connection with applications for Orders made under section 1 of the Gas Regulation Act. The National Gas Council have cognizance of this, and are going to join issue with the railway companies at the first inquiry held under the Act. The railway companies having been unsuccessful while the Bill was in Parliament, the Board of Trade will have excellent precedent for rejecting any quixotic proposals put before them, or applications for preferential treatment. The Act itself prescribes the pressure and the conditions.

Coal Stocks and Export.

The Mines Department are being strongly urged to release more coal for export in view of the better production of the last few weeks. The Department have something to do preliminary to taking this course. The ravages of the miners' strike upon the home position have first to be made good. Output during the strike was cut away to the amount of approximately 14 million tons, of which 12 millions would have had inland distribution. The Department issued a statement last week which showed that the increased production was a long way from meeting the deficiencies due to the strike; and "this is clearly shown by the fact that 230 gas, electricity, and water works throughout the country have under one week's stock, and about 400 more have less than two weeks' stock, while household supplies are short in many areas." The Christmas and New Year's holidays, too, are approaching; and those who remember the early weeks of this year will fully support the Mines Department in their desire to see that home stocks are removed from the sphere of jeopardy, before there is any considerable relaxation in exports. Meanwhile, the miners might be asked to consider to what their policy of restricted output, an average wage per ton last quarter of 26s. 3d., and a strike of nearly three weeks' duration, have in combination brought the country's coal export business.

France Well-Stocked with American Coal.

They will find it reflected in the extremely interesting speech (reported in this issue) of Col. H. Le Roy Lewis, at the meeting last week of the Continental Union Gas Company. He said: "Coal prices all last year were extravagant; and the result of it has been that we have driven from these shores a very large amount of our coal trade. The Americans are now throwing coal at the heads of the French and the Italians; and I believe at the present moment France is almost over-stocked with coal." Col. Le Roy Lewis knows the condition of France and Italy almost as well as he knows those existing at home; so that what he says has authority in it." Confirmation of this statement is found in a report since published. This country has been under an obligation to supply to France some 9 million tons a year from South Wales. But it has now been agreed between the Coal Controllers of the two countries that this allocation should cease, owing to the fact that France is receiving sufficient supplies from America and Germany, and so is unwilling to take coal from this country at the high prices prevailing. This has caused a fall of the price of British coal for export. Great Britain is now only under an obligation to supply Italy with 350,000 tons a month.

Sulphuric Acid Price Reduction.

There is good news for sulphate makers in the minutes that are published to-day of the last meeting of the Central Executive Board of the National Gas Council. The Committee the Council appointed (with Mr. Thomas Glover as Chairman) to consider with the National Sulphuric Acid Association the question of the prices of spent oxide and sulphuric acid have reported; and the announcement is made that the Association have agreed to reduce the price of acid made from spent oxide from £6 2s. 6d. per ton to £5 10s. as from Jan. 1 next. Mr. Glover's remarks at the recent Southern Association meeting [see "JOURNAL," Dec. 1, p. 518] are worth recalling in this connection.

Sulphate Prices Declining.

Not such good news is that a beginning has been made in the decline of sulphate prices. It is the expected that is happening. The world-price of nitrogen is declining; and there can be no question that, as the developments proceed that are already in hand, there will be a slip to still lower levels. Facts must be looked fairly and squarely in the face. The January price will be £23 16s. per ton delivered, instead of £26 13s. 6d. A little better price will be secured in February—£24 3s. 6d.; and the March to May price will be £24 11s. What is more, the manufacturers will repay any sum in excess of £23 16s. paid for deliveries during the August to December period.

Mantles and Glassware.

The Lamp Makers' Committee of the Illuminating Engineering Society strongly object to any prohibition of the importation of mantles and lamp glassware. This objection is expressed in the report of the Committee presented at the meeting of the Society on Tuesday of last week; but, as the Society is a non-political body, it appears, from Mr. Gaster's remarks at the meeting, that they cannot take any action in the matter.

Technical Education for Gas Workers.

Labour leaders are taking very definite interest in technical education—that is to say, labour leaders who are wise, and whose vision has a much larger radius than could be defined by the length of their noses. The Joint Industrial Council for the gas industry recognize the desirability of co-operating with the Board of Education in drawing-up a general scheme of technical education for gas workers. An Advisory Committee has been appointed; and its constitution embodies representatives of gas administrations, organizations, officers, and last but not least two worthy representatives of the gas-workers' interests. The latter fact is valuable—not only in the work of designing a good scheme, but later in securing its effective operation. The names of the members of the Committee will be found in the minutes of the Central Executive Board of the National Gas Council.

Combustion and Fuel.—At a meeting of the Huddersfield Chemical Society last Friday, Mr. H. H. Gray lectured on the subject of "Combustion and Fuel." He gave an historical survey, and pointed out how important it was for fuel conservation and economical power generation to be studied nationally. He criticized the proposals to erect huge super-stations for the generation of electric power as being wasteful, because the thermal efficiency of electric power generation was only one-fifth that of gas power. He commented favourably upon the proposed harnessing of the River Severn, as being a step in the right direction, because natural power was being brought into use.

Comparative Therm Tables.—There has been received from the "Gas World" Offices, No. 8, Bouverie Street, E.C., a copy of "Comparative Therm Tables: A Concise Guide to Gas Policy under the 1920 Act," by H. R. Askew, Assoc.M.Inst.C.E. In his preface, the author states that he has attempted to reduce to their simplest terms some of the problems presented now that the Gas Regulation Act is being put into operation, and to illustrate by typical formulæ the changes that the new heat-unit basis will introduce. Detailed comparative tables have also been drawn up, showing the conversions of various factors. Part I. includes the conversion of therms to thousands, and thousands to therms, variations in therm prices corresponding to 1d. per 1000 c.ft., &c., and some suggestions for the amount by which therm prices should be varied at a time. Part II. shows the conversion of sliding-scales to a therm basis, with some examples of their working. Part III. discusses an alternative to a sliding-scale. The text of the Gas Regulation Act and the Board of Trade regulations issued in connection with it are included as appendixes.

PERSONAL.

PRESENTATION TO MR. R. A. HEPWORTH.

Advantage was taken of the annual social, at the Midland Hotel, Manchester, last Saturday week, to make a presentation, at the conclusion of the dinner, by the Directors of Messrs. R. & J. Dempster, Ltd., to Mr. R. A. Hepworth (the Managing-Director), to commemorate his fifty years' service with the firm. The gifts comprised a silver salver suitably inscribed and three engravings.

In making the presentation, Mr. Robert Dempster said he remembered Mr. Hepworth coming to them in June, 1870, and concentrating his whole energies upon the study of engineering. He had in a great measure helped to raise the firm from a very humble position to a world-wide reputation. Whatever Mr. Hepworth undertook to carry out, he did thoroughly; and this trait in his character had been of inestimable value. He never wavered in doing what he considered his duty; being faithful to the firm, and faithful to his friends.

In reply, Mr. Hepworth said that, when a man completed his jubilee of fifty years' continuous and unbroken service with one family or firm, it not only signified what he had done, but it also signified what had been done by those with whom he had co-operated through all those years. They had been strenuous years, and years of difficulty at times; but they had been years of progress, for it had always been the aim of the firm to reach a higher position. He joined the firm as a boy, and thought he had had a share in almost every part of the work during the intervening years. Mr. Robert Dempster, Mr. John Dempster, and himself were very nearly of an age. They were all brought up together, and had all worked together. He wished to thank the Chairman (Mr. Charles Dempster) most sincerely for the part he had taken in connection with this presentation. As to Mr. Robert Dempster, words failed him. He was the first to welcome him into the Dempster family; and from that day to the present, he (Mr. Hepworth) had always received at his hands the greatest kindness and friendship. To each and all of the Directors, he tendered very hearty thanks. So long as he lived, his earnest wishes would be for the prosperity of R. & J. Dempster, Ltd.

Together with the Directors and their wives, upwards of a hundred of the staff enjoyed the evening's festivities, which comprised a dance, interspersed with musical items contributed by employees.

Among the latest awards for war services, we are pleased to see the name of Mr. MAURICE GRAHAM, who has had conferred upon him the honour of C.B.E.—Commander of the Order of the British Empire (Civil Division)—for valuable services to the Ministry of Shipping in the capacity of Construction Engineer.

OBITUARY.

HENRY J. SMYTHE.

It was with regret that we received, when on the point of going to press with this issue of the "JOURNAL," news of the sudden death last Friday, at his residence, "Woodlands," Borough Green, Kent, of Mr. Henry J. Smythe, who was Engineer and Manager of the Maidstone Gas Company for the long period of 33 years, from which position he retired in May, 1911, on account of ill-health. Mr. Smythe served his apprenticeship with Messrs. Henry Balfour & Co., and afterwards worked for a short time under Mr. Cathels at what were at that time the Crystal Palace District Gas-Works. From there he went to erect, and subsequently to manage, gas-works at Cardiff. He was later Manager of the Callao (Peru) Gas Company for about four years, at the end of which time the state of his health compelled a return to England. Then Mr. Smythe became Assistant to Mr. John West, at Maidstone, and afterwards succeeded him when, in 1880, that gentleman was appointed Chief Engineer of the Manchester Corporation Gas-Works. He joined the Gas Institute in 1882; and was President in 1894 of the Southern Association of Gas Engineers and Managers. The interment was yesterday.

The death has taken place of Mr. THOMAS SMITH, formerly Gas Manager at Methven, Perthshire. He was 75 years of age.

The will has been proved of Mr. Alexander Mackay, of Messrs. Alder and Mackay, who left estate of the value of £90,880 gross.

In an address to the Chemical Section of the Manchester Literary and Philosophical Society, on the subject of a national scheme of fuel economy, Mr. David Brownlie said that some of the methods suggested were the proper utilization of blast-furnace gas, more efficient ways of steam generation, the use of refuse coal at collieries, oil fuel, the development of peat, the using of water power, super-power stations, &c. In his opinion, there could be saved 50 to 60 million tons of coal per annum in this country, equal to over £100,000,000.

ELECTRICITY SUPPLY MEMORANDA.

SEVERAL local authorities are taking advantage of the newly acquired power under the Electricity Supply Act to let on hire electrical apparatus; and probably many consumers will be prepared to give various appliances a trial on the representations of the canvassers or show-room attendants of various electricity departments. Trial and experience will no doubt work wonders for the local gas supply, as nothing has happened to make electrical operation more reliable, or to do what is physically impossible—give to the electrical unit greater heating power than 3420 B.Th.U. The Maidstone Electricity Department has issued its hiring rates. They are interesting. The circular-letter to consumers is headed "Hire of Electrical Labour Savers"—not "Hire of Electrical Wasters of Money and Time." It would be too much to expect the department to decry its own wares. Time will, at Maidstone, produce its revelations, as in other places. We observe that there is no information as to the capacity of the electric cooking stove and the electric fires that are offered to the consumers, nor is there anything to guide as to the cost of installation. Whether the rent covers installation is not stated. The electric cooking-stove, it is said, comprises oven, grill, steamer, and boiling-plate; and the rent is 15s. per quarter, or £3 a year. All that is on the hot-plate of an electric-oven has a very low efficiency; so that the rent of the stove will not represent a large proportion of the cost, assuming that the grill, steamer, and boiling-plate get the same amount of use as the top plate of a gas-oven. Small sized electric-fires are to be let out at 2s. 6d. and 3s. per quarter according to finish, and large sizes at 3s. 9d. and 4s. 3d. But what these sizes consist of is not known, so that their capacity for work cannot be investigated, nor their cost for running during wintry weather such as has been experienced lately.

Hiring Rates at Maidstone.

A Farcical Water-Heating Proposition.

We are interested, not to say amused, by the next announcement in the circular-letter. It reads: "HOT-WATER TANKS. This arrangement provides a constant supply of hot water at 160° Fahr. up to 10 gallons in each 24 hours; and the total charge, including hire of tank and cost of all electrical energy, is £7 10s. per annum." Whether many consumers will be tempted by this offer is open to very serious doubt. Labour-saving should represent a saving of time, otherwise the work entailed in doing a thing will be unduly prolonged, and in the end time will be wasted. Just think what 10 gallons of water at 160° Fahr. means on washing day, or for house cleaning, or for bath purposes; and only 10 gallons of water at that temperature can be obtained in twenty-four hours! If one person in a house has a 10-gallon bath of hot water (10 gallons do not go far in an ordinary sized bath, and it would probably have a few gallons of cold water added), then a second person can only have a bath after the expiration of another twenty-four hours, and so on; and the supply must not be used for other purposes in the meantime. And for this very modest service a fixed sum of £7 10s. has to be paid. Ten gallons of hot water at 160° Fahr. can be obtained with a gas-geyser in less minutes than it takes hours with the electric hot-water tank. Apart from the inconvenience to the household of the dilatory electrical method of heating a bulk of water, it is clear that this is not going to be a very profitable venture for the Maidstone Electricity Department. Ten gallons of water are equal to 100 lbs.; and supposing the water enters the heater at 48°, this would mean, at 100 p.ct. efficiency (which would be an absurd assumption, in view of the heat losses that must take place during twenty-four hours), that it would require 11,200 B.Th.U. to heat-up the 100 lbs. of water to 160°, or 3¼ units of electricity. More than this quantity of current would be needed in view of the heat losses. Taking, however, only the 3¼ units of electricity, in 365 days 1216 units would be used. The £7 10s. would work out to 1½d. per unit. And the 1½d. has to cover capital charges, installation, maintenance, and renewal expenses, and electricity used (including the current to cover heat losses). Now we ask is this a paying proposition for the department, especially in these times? And is it a convenient proposition for any householder to entertain? We think the facts given warrant a reply to both questions in the negative.

The Reliability and Safety of Electricity.

During the past few weeks electricity has been misbehaving itself in a scandalous manner. Failures have been recorded in the West-end of London, at Swansea, Belfast Wolverhampton, Rotherham, Southend, Wallasey, and even the Institution of Electrical Engineers had a short diversion at the first meeting of the new session through the fusing of a wire. More deaths due to electric shock have been recorded—one at the Sheffield works of Messrs. Vickers, and another at the Sunnybrook works at Longwood. A defective electric wire dared to cause a fire at the Bishopsgate Fire Station; and the "Punch" Tavern in Fleet Street has experienced trouble in the same line, and the fusing of an electric wire appears to have been the only traceable cause. A piece of pavement at the junction of Oxford and Whitworth Streets, Manchester, recently underwent an uplifting through the electric cable indulging in the promotion

of a combination of circumstances that favoured an explosion. The circumstances of the explosion of a turbo-generator set at the Woolwich Borough Council electricity station have received wide publicity. The estimated damage is £30,000. Three employees were injured, one seriously; and a boy riding on the top of a 'bus a considerable distance away was killed by a piece of flying metal.

The Case of Hereford. Hereford got a lot of advertisement recently over its rural electricity supply ventures, on which the Department are proposing to spend much more money. Misgivings as to the policy of the Department seem to have taken hold of a good section of the community, and they are not at all sure of the economic situation. In fact, there seems to be a most uncomfortable feeling abroad in the town, which the Chairman of the Committee (Mr. E. R. Dymond) has been trying to dispel. But what has made the feeling more acute is that the electricity consumers in the borough have been suffering somewhat seriously from breakdowns; and so we hope the view is rather prevalent that, instead of spending so much money on rural ventures, the Committee might be more profitably employed in setting their town house in order. These breakdowns have been more frequent of late. It is said they are due to the use of the steam-roller. We take it the steam-roller is not a modern arrival at Hereford. But there it is. Those who were responsible for the original plans of the electricity distribution plant laid it in an "improper manner and in improper places;" and the steam-roller seems to find delight in taking advantage of the weakness of the distribution system, and in repeatedly putting the electricity consumers to inconvenience. The Committee calculate that to correct things by relaying the cables, some £40,000 would have to be spent. This is an expenditure that the Committee do not recommend; and so we take it, if the steam-roller is to be allowed to go on with its normal work (with its harmful consequences), interruptions of supply will have to continue.

Old Works Producing Cheaper than New. A lot has been written about the uneconomy of the smaller old electricity stations; and we know that many of them are being run to-day at a loss. The uneconomy is generally assessed on the fuel basis; but capital expenditure on electricity plant, as has been frequently shown, is not an unimportant consideration in these times. A curious eye-opening tale comes from Kirkcaldy. The Town Council in the opening part of this year were desirous of extending their electricity plant; but the Electricity Commissioners, in their wisdom, declined to sanction the expenditure, and advocated a bulk supply being obtained from elsewhere. The Council considered their position, and came to the conclusion that their best plan would be to sell the concern—lock, stock, and barrel. They thereupon, so we gather, made inquiries of the Fife Power Company, as to purchasing the undertaking, or alternatively to supplementing the town supply with a bulk service. But they find the cost of the bulk supply would be greater than the overall expense of generating with the old plant. The discovery they have made is that their ancient plant, which cost less money than generating plant can be bought for and installed in these days, can do better in respect of total costs than modern plant. Modern plant may produce more units per ton of fuel used; but apparently, in the case of Kirkcaldy, the extra capital charges wipe-out that advantage, and leave something to the bad. The pity of it is that plant will not last for ever; and capacity cannot be enlarged without spending money on current terms. So something will have to be done. But the Kirkcaldy Council do not feel disposed to part with their old plant under these conditions; and therefore they are asking the Fife Power Company what supply they can contract to give, and on what conditions.

New Electricity Supply Bill. The amending Electricity Supply Bill which was introduced into Parliament early this session, and was intended to supplement the powers in the 1919 measure, is not to be revived. It will be remembered that it contained powers as to District Boards, compulsory purchase of generating plant, and provision for financial assistance from the State, subject to repayment. The electricity supply industry is almost unanimous in hoping for this financial assistance, but the other powers are not palatable, and are not wanted. Matters have undergone a vast change. Pressure is being brought upon the Government to curtail their expenditure, and to stop incurring new financial commitments until times are more propitious. A new Bill has been introduced into the House; and this the electricity industry now knows does not countenance any charge upon the public funds. The Electricity Commissioners are of opinion that voluntary joint authorities will bring about the desired improvement in electricity generation without the aid of compulsory powers; so that this controversial aspect of former proposed legislation has been jettisoned. As to finances, the new Bill proposes to confer upon the joint authorities the necessary borrowing powers, and also contemplates authorizing local authorities and electricity undertakings to lend money to joint authorities, or to assist financially in other ways—such as by guaranteeing interest. This we regard as a mistake. The joint authorities as electricity generators should be given borrowing and charging powers commensurate to their needs, so as to make the concerns independent and self-supporting. It should be a matter for the ratepayers whether or not they will allow their local governing body to enter into loaning money or guaranteeing interest in connection with a trading body in which the local authorities are only units, and therefore have no individual but only partial control through collective decision. Provision is also to be made to authorize large railway and tramway generating stations to supply to joint authorities any surplus power they may possess. This is all very different from what was originally proposed.

The Severn Power Project. Sir John Snell is Chairman of the Water Power Resources Committee of the Board of Trade. He is also Chairman of the Electricity Commissioners. These facts impart additional interest to the third interim report of the Water Resources Committee, which deals with tidal power generally, and with the Severn scheme particularly. The Committee remark in the course of the report that the utilization of tidal powers involves the solution of many complex problems; and though they are of opinion that a *prima facie* case has been made out for the Severn scheme, further investigation of a number of physical and technical questions requires to be made. This shows prudence. Preliminary estimates indicate, however, that if the Severn tides were employed, energy could be generated and utilized at a favourable rate, and that the power obtainable throughout an industrial day of ten hours would be of the order of 260,000 KW., and the consequent saving of coal would be from 1,250,000 to 2,500,000 tons annually. This is a reduction of the estimate made by the engineers of the Ministry of Transport. The energy, approximating to 1000 million units per annum, might be utilized by industrial organizations in the Midlands and South Wales, in railway electrification, and by undertakings established on the banks of the Severn near the site of the power development. The Committee recommend that the Board of Trade, in consultation with the Ministry of Transport, should set up a Special Technical Commission, consisting mainly of expert engineers and persons of scientific attainments, to investigate the possibility, from a commercial standpoint, of utilizing the tides for power purposes. The inquiry, it is suggested, should be pursued with special reference to the Severn estuary; and the Commission should prepare a preliminary design and reasonably detailed estimates of cost of a tidal power scheme for that estuary, taking into consideration the desirability of making provision in it for road, railway, and shipping facilities suited to the requirements and possibilities of the adjoining district.

Ratio of Storage Capacity to Daily Output.

Mr. George Wehrle, of the Denver Gas and Electric Light Company, writing in the "Gas Age," says he does not know whether Denver's gasholder capacity as compared with the daily output is the smallest in the world; but if there are any cities of the same class operating with as low a ratio, he is not familiar with them. The Denver Gas and Electric Light Company believe their operations in this connection to be unique. When the present gas plant of the city was erected in 1888, the holder capacity was almost three times the daily output; "but the designer of the plant builded twenty years into the future, and therefore lost for the owners a large sum of money represented in interest that might have been obtained on the investment required to build a 720,000 c.ft. holder," for no more holders were erected in Denver until 1909, when a 500,000 c.ft. district holder was put up in a residential area some miles from the plant. In the meantime the city had so grown that from a ratio of three to one the holder capacity to the daily output had become one to three. The new holder was not erected on account of operating difficulties caused by lack of storage capacity, but because the growth of the city had changed the load centre from the gas plant to points several miles distant. The cost of new mains was balanced against the cost of a district holder using the old mains, and was found greatly to favour the latter scheme. When this holder was started in service, the ratio of capacity to output became one to two; but now it is practically one to five. Present operations mean that in theory the works holder is filled and emptied almost ten times each day, while all holders are filled and exhausted five times each day. No less than 75 p.ct. of the daily output is consumed in twelve hours, and 10 p.ct. during the peak hour. Are the Company wrong in their opinion that large holder capacity is unnecessary to the successful operation of a gas plant? Their experience would go to show that they are not; for there has never been an interruption of service. Large stocks of gas, he argues, can be of no value except as safeguarding against service interruption, in which case they become a very expensive insurance. In fact, much cheaper insurance may be obtained by the provision of proper duplication of important production apparatus, and in the elasticity of operating equipment and methods employed. At present the Company are building two additional 500,000 c.ft. district holders, with the same object as before of improving distribution conditions, while adding storage. This will again make the ratio about one to three. To sum up, Mr. Wehrle thinks a straight water-gas plant might use a ratio of one to five; while straight coal-gas plants might require a ratio of one to three, in order to obtain continuous production operation. Certainly a ratio of one to one could never be justified.

NATIONAL GAS COUNCIL OF GREAT BRITAIN AND IRELAND.

SECOND ANNUAL GENERAL MEETING.

THE Second Annual General Meeting of the National Gas Council, as reconstituted, took place last Wednesday afternoon, in the Æolian Hall, New Bond Street, W., under the presidency of Mr. D. MILNE WATSON, who was well supported by a representative attendance.

The first business was the confirmation of the minutes of the last meeting, which were taken as read.

MEMBERSHIP OF THE COUNCIL.

The PRESIDENT announced that there were now 187 ex-officio members, 1 honorary member, 705 subscribing undertakings, and 1306 representatives.

THE PRESIDENT'S ADDRESS.

The PRESIDENT, proceeding to address the meeting on the work of the Council, said that when they last met a year ago, they did so under the shadow of a great disappointment to the gas industry that nothing had been done for it by Parliament. To-day they were meeting under much more hopeful circumstances. Parliament had passed the Gas Regulation Act; and now the industry looked forward to the restoration in some degree of its pre-war fortunes. In this respect they were, he supposed, a much happier body of men than was the case twelve months ago. ["Hear, hear."] It would no doubt serve a good purpose if he briefly reviewed the work of the Council during the past year, and also indicated their views for the future. With regard to the National Gas Council, the whole tendency from its beginning had been one of steady growth. This, of course, denoted a very healthy position. The past year had been one of increasing activities, and he thought that they would agree with him that good results had been obtained.

THE GAS REGULATION ACT.

It was in this hall, rather more than twelve months ago, that they took the important decision not to promote individual Bills in Parliament, but to call upon the Board of Trade to make good their promise of legislation. This decision, he thought, had been amply justified by experience. If they had promoted individual Bills, there was little doubt but few of them would have been able to obtain satisfaction; and, instead of this, they had succeeded in securing a new charter for the whole industry. It would be remembered that, when addressing them on the question of financial hardships, he had always been optimistic with regard to the intentions of the Board of Trade, when they had promised to remedy the deplorable state of the finances of the gas industry, brought about by the exigencies of the war. It was quite unnecessary for him to weary them with details of the various steps which led up to the passing of the Act; but he could assure them that the matter called for great energy and diplomacy on the part of their staff. The Board of Trade constantly consulted the Council during the drafting of the Bill; but so difficult was it to meet the requirements of the various interests throughout the kingdom that, when the Bill came up for consideration at the Committee stage, the Council put down no fewer than ninety amendments in the interests of the industry. This would give some idea of the amount of work involved.

Subsequent to the publication of the report of the Fuel Research Board, steps were taken to secure modification of certain of the recommendations contained in the report; and many meetings with Sir George Beilby took place. He would like to pay tribute to the broad-minded and the sympathetic way in which Sir George met the difficulties pointed out by the Council, and also to the help given by the Board of Trade. As a result of the negotiations, an agreement was arrived-at, which, though not altogether embodying the views of the National Gas Council, was in itself a great triumph—especially in that the absolute and definite limitation of the percentage of inerts (which was one of the stumbling-blocks, and would have been quite unscientific) was removed. The Board of Trade took the precaution of having round-table conferences with regard to the Bill, before it was introduced, with the representatives of various local authorities, railway companies, and large consumers. In this way, a great deal of opposition was overcome. The Federation of British Industries also rendered assistance to the Council, enabling them to meet the Sheffield Gas Consumers' Association; and the Council succeeded in satisfying the Association that the interests of users of gas were amply safeguarded by the Bill. The result was that all active opposition to the Bill was withdrawn by the Association practically before they reached the House of Commons. Another great difficulty with which the Council had to contend was the strenuous opposition of the railway companies and local authorities, who endeavoured in both Houses to obtain statutory sanction providing for an increased pressure of over 20-10ths of an inch in the event of the calorific value of the gas being less than 500 B.Th.U. The Council were successful in preventing this proposal being incorporated in the Bill in a definite form, and established the principle that no one class of consumers was entitled to special or exceptional treatment.

He felt that he would like to take this opportunity of thanking the members of the Council for their energetic co-operation in the endeavour to set the whole facts of the position before the members of Parliament in the different constituencies. As those present would probably be aware, when the Bill was passing through its various stages, several meetings took place with members of Parliament attended by representatives of the industry from all over the country. The Council also enlisted, through the medium of the Joint Industrial Council, the interest of the representatives of labour, both in and out of Parliament, in support of the Bill; and they secured, he was glad to say, their co-operation in getting the measure passed. As a result of all these combined efforts, the Bill became law on Aug. 4 last. It was passed through, he thought, in either nine or eleven weeks, which was a very considerable achievement, when one considered the great congestion of public business which existed at that time in the House of Commons. He would not like to pass from this subject without specially mentioning the great help that the Council received from their legal advisers in connection with this very difficult and complicated measure.

Now, the Act had given them really a new charter. It would enable them, with a comparatively tranquil mind, to look forward to whatever might happen, because within the Act was contained machinery by which, whatever might come to pass in regard to costs, &c., they would always be able to go to the Board of Trade and put their case before them, and get matters adjusted according to the requirements of the case, without incurring the enormous expense involved in individual promotion of Bills in Parliament. This was a tremendously valuable asset, because no one knew in these days what might turn up. It was in every way desirable that there should be on the Statute Book, on behalf of this great industry, a measure which would enable them to go, without great expense, to the Board of Trade, and get revision of their sliding-scales and maximum prices. The Act provided that gas undertakings should sell their gas by therms; while it placed in their hands an easy method of bringing about amalgamations, raising capital, arranging for the sale of gas in bulk, and a large number of other things.

APPLICATIONS FOR ORDERS UNDER THE ACT.

After the Bill became law, the Council came to the conclusion that it would be advisable for certain selected gas undertakings to make first application to the Board of Trade; and they were assisted in the choice of 33 undertakings by a careful inquiry held by each of the District Executive Boards. Some sixty applications had now been made to the Board of Trade under section 1 of the Act, and it was expected that the first private inquiry would be held the following week, and that shortly after Christmas the first Orders would be made. In several instances, with regard to applications that had been made, railway companies had lodged objections with the Board of Trade, reiterating the claim made on their behalf in Parliament that a higher minimum pressure than 20-10ths should be prescribed for calorific values below 500 B.Th.U. They were also asking—what was absolutely contrary to the letter of the law—that the gas undertakings should, upon making the application for an Order, declare the standard calorific value they proposed to supply. But this was entirely outside the Act. This matter would, he understood, be coming before the Board of Trade early in the new year, when the whole question would be dealt with. The railway companies were most persistent. They were beaten in the Commons, in the Standing Committee of the Commons, as well as in the Lords; but they returned to the charge on some of the clauses in the Act which gave them a loop-hole. At the same time, the gas industry had a good case; and he hoped the result would be satisfactory when the matter came to be laid before the Board of Trade. Rules had now been issued by the Board of Trade in connection with applications for Special Orders; and it would be seen that this procedure provided an extremely simple, economical, and rapid method for obtaining powers which, heretofore, had had to be sought through the much more expensive and elaborate method of an Act of Parliament or a Provisional Order.

PUBLIC UTILITY COMPANIES (CAPITAL ISSUES) ACT, 1920.

As a result of the Council's representations to the Board of Trade as to the gas and other public utility undertakings, wth regard to the difficulty experienced by undertakings in raising capital, the Public Utility Companies (Capital Issues) Act, 1920, was passed. This was, of course, common to gas, water, and similar undertakings; and the Council acted jointly with other bodies and along with other public utility concerns in urging the Government to introduce this Bill. The Bill became law in due course, and offered very considerable relief to the industry. It extended the borrowing powers of gas undertakings, and was intended to act as a temporary measure of relief, until the recovery of the financial position of the country. The Bill was followed carefully during all its stages through Parliament; and amendments were introduced on behalf of the Council in the interests of the gas industry.

THE CORPORATIONS PROFIT TAX.

During the intervals between the work connected with these two Acts, the Council were occupied in safeguarding the industry

in other parliamentary matters. For instance, again working jointly with other bodies, they were successful in obtaining the exemption of both maximum dividend and sliding-scale undertakings from the Corporations' Profit Tax for, at any rate, three years.

GREAT NORTHERN RAILWAY BILL.

The Council also, in the same way, succeeded in their representations in connection with the Great Northern Railway Bill; and the Railway Company ultimately decided to leave out all reference to gas and electricity undertakings from the clause in the Bill giving power to the Railway Company to take supplies of gas, water, and electrical energy and to distribute them along the line of railway to any point outside the area of supply of the gas and electricity undertakings.

THE PROBLEM OF COAL.

Coming to the great question of coal, he thought the industry was to be congratulated on the fact that, notwithstanding the difficulties of the past few months, stocks of coal had been maintained; and in not a single case, he believed, during the miners' strike did a gas undertaking have to close-down. The Council took the precaution, some months before the strike, of collecting statistics from their members with regard to coal stocks, and communicated with the Mines Department in cases where stocks were unduly low. They also did their very best—with, he was glad to say, some success—to get these stocks increased. There were undertakings, of course, that were still short of coal; and the Council would continue to urge the Mines Department to provide gas undertakings with adequate supplies of coal—and good coal, too ["Hear, hear."], because this also was a very important question. The coal that had been coming in during the last year or two was really a disgrace. He had known of cases in which there was over 30 p.ct. of ash, thereby unnecessarily taking up wagons, wasting labour, and causing enormous loss to the users. It would be a convenience if members would make a point of letting the Council know when they experienced any trouble of this kind, so that the matter might be immediately taken up direct with the Mines Department.

SUB-COMMITTEE ON COOKING-STOVES.

A Sub-Committee were now at work drawing-up standard specifications of cooking-stoves, with a view to meeting the requirements of the various districts throughout the country. A good deal of headway had been made by the Committee; and their report was expected shortly.

SPENT OXIDE.

The Council had made strong representations to the National Sulphuric Acid Association, to the effect that the price of sulphuric acid sold to gas undertakings must bear some relation to the price of spent oxide supplied to the acid manufacturers—it having been the experience of the gas industry that the price of acid had advanced in far greater proportion than the price paid for spent oxide. The price of acid, however, he was glad to say, would likely soon come down—no doubt, very largely due to the Council's continuous representations.

A perusal of the report would show that there had been no slacking off in the activities of the Council. They had a number of important matters to deal with during the coming year; and, at the next annual meeting, they would hope, among other things, to be able to report the adoption of a standard pattern of cooking-stoves and parts throughout the country, and a satisfactory arrangement with regard to the price of both spent oxide and sulphuric acid.

JOINT SUBSCRIPTIONS.

Since the reconstitution of the Council, subscriptions in many cases had been received covering subscriptions to the other Associations connected with the gas industry. This had been found to be a great convenience, especially in the case of municipalities, where it had proved undesirable to make more than one application during the year for subscriptions to Associations connected with the gas industry. The Council had recently had under consideration the desirability of a joint subscription to cover subscriptions to the British Commercial Gas Association and the Council, and to include an annual sum to be handed to the Institution of Gas Engineers for research purposes. A Joint Finance Committee of the three bodies had gone carefully into the matter; and their report was considered at a joint meeting of the Council of the Institution of Gas Engineers, the General Committee of the British Commercial Gas Association, and the Central Executive Board of the Council. As a result, it was suggested that there should be a combined subscription of 5s. per million c.ft. of gas made. He was glad to say that a large number of gas undertakings had already notified the Council that their Boards were prepared to subscribe on this basis; and it was hoped that the industry as a whole would respond generously to the appeal.

DISTRICT SECRETARIES.

He would like to emphasize the importance of the reference in the annual report to the excellent work done by the District Executive Boards, and particularly that branch of the work undertaken by the Secretaries of these Boards throughout the country during the past year. Without the co-operation thus received, the Council could not have hoped to have carried out half the work that had been done; and they would have lost that local colouring and touch which were essential for an industry covering the whole country, and graduating from small village undertakings to large metropolitan concerns. It was absolutely necessary that the Council as a whole should be constantly in touch with the individual requirements of each district, and know its peculiarities.

THE BENEFITS AND CHEAPNESS OF ORGANIZATION.

It should be pointed out now, after two years' experience of the National Gas Council, that other industries in this country had been organized; and that therefore the gas industry were only doing what the others had done. United action and organization were clearly in the interest of the industry, in dealing with the big problems which constantly faced them. It was manifestly a great advantage in dealing with the Government that an industry should be organized as a whole, rather than that individual undertakings all over the country should take up questions themselves. They would produce far more effect in a Government office by going as a National Association than if they went as individuals or as a small group of undertakings. They would, he was sure, agree with him that it would never do for the gas industry to lag behind in these times of general organization. He hoped, therefore, they would recognize the value of the work done by the Council and the other bodies associated with them, and that every one would pay the increased subscription. It was a very moderate amount, after all said and done. This great industry at present spent about £35,000 a year on its organizations—viz., the National Gas Council, the British Commercial Gas Association, and the Institution of Gas Engineers; and it was proposed now to ask for some £50,000. This might possibly seem to some of them a large amount; but what was it, compared with what other industries were doing? There was the transport industry, which required about a million of money to run, as against the £50,000 for the organization of an industry like their own. Then electricity had to have Commissioners, and an enormous expenditure for development; whereas the gas industry, plodding along by themselves, had achieved the great results to which he had drawn attention. He knew there were critics; but what was an expenditure of £50,000 in respect of the activities of an industry of the importance of that with which they were dealing? ["Hear, hear."] They had received very great assistance in their work from the bodies associated with them. The British Commercial Gas Association looked well after the commercial interests; the Institution of Gas Engineers dealt with technical questions; and the Gas Companies' Protection Association rendered help when parliamentary matters of importance cropped up. Then he would like to say a word in praise of the staff. No organization was ever better served than were the Council by their staff, who worked early and late, without grudging either time or strength; and he had been told by many friends up and down the country that they were always met with courtesy and with an earnest desire to answer any questions that might arise.

ROMANCE OF THE GAS INDUSTRY.

The gas industry was a most important one, though there were really very many people who did not realize how important it was. There were even some engaged in it who did not fully realize its importance. The capital invested in it was about £150,000,000; it employed well over 100,000 men; and it was one of the largest users of coal in the country, the requirements amounting to some 20,000,000 tons per annum. These figures indicated the importance of the gas industry; but it was important in other ways. It was one of the very few industries that had tried to adjust matters by Act of Parliament between the consumer, the shareholder, and the employee. The sliding-scale, maximum price, auction clauses, co-partnership, and other things were practically peculiar to the gas industry. This industry, well over a hundred years old, had set an example in these ways which might well be imitated by younger rivals.

One was always reading about the romance of the road, the romance of the railway, and the romance of electricity; but had the wonderful things been done in these directions that had been done by the gas industry out of a lump of coal? Out of black coal, their industry sent gas into houses and factories all over the country, for driving engines, heating, cooking, lighting, and for many other purposes involved in the complicated civilized life of to-day. And they did not stop there. They provided the fertilizer that made fields grow green; they provided the dyes that coloured cloth and printed the letterpress of the great newspapers, &c.; they provided drugs which saved life and alleviated suffering; they provided the high explosives essential to the winning of the war; and they provided also the cyanide which unlocked gold from the earth. In fact, there were very few things that were not found to come from this little lump of coal. It was like a Philosopher's Stone. The gas industry was nothing to be ashamed of, but was a thing to be worked and fought for. Talk of the romance of other industries—why, the romance of the gas industry was greater than them all. It might be said that he himself was romancing; but he felt that these things needed to be brought home occasionally, because they were so apt to think of themselves as a "hum-drum industry," whereas they were in reality rendering the very greatest services to the community.

He admitted freely that they could not do all this by means of a Council or an Association; a great deal had to be done by individual effort. He was an individualist, too. Because they belonged to the National Gas Council, they were not going to give up making special efforts themselves. Indeed, they must work together in combination, as well as work individually in the background. Therefore they were meeting that day as a National Gas Council; and he would plead once again for full support for

the Council and the associated organizations. The Council were going to be the champion of many of their hard-won liberties.

THE REPORT AND ACCOUNTS.

The LORD MAYOR OF MANCHESTER (Alderman William Kay), in moving the adoption of the report [which will be found on p. 631 of last week's issue of the "JOURNAL"] and the audited statement of accounts, said, as Hon. Treasurer to the Council, he did not hesitate to declare that the work was being done in a very economical manner. They got wonderful value for their money; and everybody should remember this. During the past few sad years, they had not been able to take full advantage of the Council, because they had been engaged at the utmost pressure on their works, in consequence of inability to carry out extentensions and improvements; but they must think of the future. The spade work that had been done so economically in the past would have enormous effect in the near future. Speaking for Manchester, for the last seven years they had not been able to give an unrestricted supply of gas. They had been, and still were, short of gas; and therefore it became more essential than ever for them to look ahead to the time when new plant under construction would come into use. Speaking from the municipal point of view, he would like to say also how necessary it was that they should stand shoulder to shoulder in working for this wonderful industry. The President had spoken of the romance of the industry, but he (Alderman Kay) would rather say "reality" of the industry, seeing what it had accomplished during the war. For the first time in his life, in 1913, he saw toluol; and he saw it in Berlin. When he recalled the marvellous efforts the gas industry put forward during the war years, under Lord Moulton, he felt proud, and well justified in the work he had tried to do. As to coal, Manchester had been very badly hit with regard to supplies; but the Council had dealt with this, as they had dealt with most things of interest to the industry. He was delighted that in so short a time—and they ought to remember the short time the Council had been in existence—so much progress had been made. An industry like the gas industry had no termination. The possibilities of gas were beyond the ken of man; and under sound guidance the Council would in future give an even more wonderful account of itself.

Mr. C. V. BENNETT (Rochester) seconded the motion.

COAL AND TAR.

Mr. S. MEUNIER (Stockport) said he would like an expression of opinion as to whether the Mines Department had under consideration a return to something like pre-war methods by allowing gas undertakings to obtain coal from their customary sources of supply. The experiences of some of them in the North with regard to Durham and Northumberland coal had been anything but gratifying. As to tar, there was a scheme brought up some three or four years ago, in connection with co-operative dealings. There had been one or two agreements formed; and in principle the idea of such a scheme was received very favourably by them in the North. But there had been a feeling among them that the conditions were not as fair or as reasonable as they had a right to expect. They had endeavoured, at considerable labour, to obtain figures which would show them just where they stood, especially those selling under a sliding-scale; but not until lately had they been able to do so. It was largely due to the efforts of Mr. Parry, of Oldham, that they knew so much about it now. At any rate, Mr. Parry had, in conjunction with the tar distillers of the district, arrived at a scale which was considerably better than the ones lately in force, and which in the opinion of both sides was much fairer. This was not yet definitely settled. There were one or two points upon which they wanted more information. He believed, however, that Mr. Parry had sent full particulars to the National Gas Council; and he would like the Council to take these into consideration before pressing any other districts to accept the original proposal.

The PRESIDENT replied that the Council were still pursuing the question of coal, and would continue to do so; but he thought there was a considerably improved state of affairs in this respect in many parts of the country. In any case, it was a subject with regard to which they were practically daily in touch with the Mines Department. The particulars as to the tar scheme had just been received, and would have careful examination.

COAL AGAIN.

Mr. L. J. LANGFORD (Tunbridge Wells) said that, on behalf of his Company, he wished to raise the question of the quality of coal. He hoped the Council were doing something to get rid of the big percentage of inerts that they were getting in the coal at the present time. This was a matter from which they were suffering very much; and if the Council could do something to relieve it, his Company would be very grateful.

The PRESIDENT remarked that they were all absolutely "in the same boat." It was a national scandal, the way in which coal was coming forward; but the gas industry were not the only people who were suffering from it. The more they insisted, the better; and he hoped that in time they would be able to prevail upon the collieries to send them better coal.

APPRECIATION.

Mr. T. H. HAZELL (Newport) said he thought it was due to the President that there should be some expression, on the part of those assembled representing the gas industry throughout the kingdom, of appreciation of the services of the President both in the past and in his address that afternoon. He (Mr. Hazell) believed that he had attended pretty well every public meeting of the National Gas Council; but he had never heard the President to better effect, and certainly never with more satisfaction, both in regard to the history of the past and his note of confidence for the future. All the President had said was quite true; he had only given a sketch of what was done by the National Gas Council. It was due to the President and those who supported him that the members should give expression to their appreciation.

The report and accounts were then unanimously adopted.

RETIRING OFFICERS RE-APPOINTED.

On the proposition of Alderman HOPKIN MORGAN, seconded by Mr. H. E. BLOOR (York), the retiring officers were re-appointed. They were: Hon. Treasurer, the Rt. Hon. the Lord Mayor of Manchester (Alderman Kay); Hon. Auditors, Mr. E. L. Burton and Mr. George Clarry; Hon. Secretaries, Mr. F. W. Goodenough and Mr. W. E. Price; and Trustees, Sir Hallewell Rogers, M.P., and Mr. H. Wade Deacon.

MR. W. DOIG GIBB AN HONORARY MEMBER.

The PRESIDENT said that, on behalf of the Central Executive, he had much pleasure in proposing Mr. W. Doig Gibb as an honorary member of the National Gas Council. His services to the gas industry were very well known; and he was a great friend of many of those present.

Mr. THOMAS GOULDEN (London) seconded; and the proposition was carried with applause.

THE PRESIDENT.

The LORD MAYOR OF MANCHESTER then proposed that Mr. Milne Watson should again be asked to accept office as President. He could not imagine that, at so critical and difficult a time, they could do better than stick to the man they knew. The splendid way in which he had managed affairs in the past gave them every confidence for the future.

Mr. BLOOR, in seconding, said he had had the very best of opportunities for gauging the qualifications of the President for the position he occupied; and he yielded to no one in his admiration for Mr. Milne Watson in his capacity as President, and his praise of the charming manner in which he carried out his difficult duties on all occasions.

The proposition having been cordially agreed to,

The PRESIDENT said he thanked them very much indeed for the honour they had done him. They were aware of his personal view that one should not occupy such a post too long continuously; but as it was evidently their wish that he should take office for another year, he would do so.

This brought the proceedings to a close.

Gas Sales and High Prices of Other Fuels.

Mr. Charles A. Munroe, the Vice-President of the People's Gas Company of Chicago, and also of the Public Service Company of Northern Illinois, and the new President of the American Gas Association, says he is not one of those who believe that the phenomenal increase in gas sales which nearly every gas company in the United States has experienced is due to any great activity on the part of gas undertakings. In his address as Chairman of the Commercial Section at the recent annual convention of the Association, he said he felt that by far the larger portion of these increases has come from causes over which the industry has had no control—namely, the high prices and difficulty of securing other competitive fuels. When coal and other fuels come down in price (as they are bound to), gas consumption is going to fall off; and many companies that are now hard-pressed for capacity, will find that they have capacity available, and that they sorely need the revenue which this capacity, if utilized, would produce. Diminution in gas sales, too, will be brought about, in his opinion, not only from the recession of the price of other competitive fuels, but also from the loss of business which over a long period of years gas companies generally have enjoyed. He stated that, at a meeting of the Managing Committee of the Section, there was a consensus of opinion on the part of those present that 30 p.ct. of the total sales of a gas company was a very fair average figure for the amount of gas sold for lighting purposes. To secure some statistics in Chicago, 600 customers were selected who had had their houses wired for electricity during the summer of 1917. The average consumption of these users over the preceding three years had been 3700 c.ft. per residence per month; and the average for the three years after wiring was 2700 c.ft. per month. From the records available, the Company estimated that they were losing residence lighting customers at the rate of 16,780 per annum. Altogether the yearly loss of lighting business amounts to 1·7 p.ct. of the total gas sales of the People's Gas Company. It is, he went on, apparent that the gas companies must make-up this loss of consumption, which is cumulative; and they must do so with a minimum of capital expenditure. The first session of the Commercial Section was devoted to industrial installations because of a belief that in this direction there can, with the minimum expenditure of capital, be secured a greater volume of sales than in any other field of activity. It was therefore with a view to inspiring with enthusiasm some of the sales representatives of gas companies, that a number of papers on this subject were prepared, some of which have been noticed in the pages of the "JOURNAL."

CARBONIZATION IN 1920.

By THOMAS SETTLE.

IN a previous issue [see "JOURNAL," Vol. CLI., p. 498] I submitted a few observations on "Carbonization in 1900," and promised to follow on similar lines in reference to the present day. The matter has been delayed on account of ill-health and pressure of business. The items now dealt with are among the leading points that are to-day in the minds of gas engineers; and the subject includes so much detail—as shown by the extent of the data that I have collected—that there is difficulty in keeping within reasonable limits of space.

The period of 1900 20 will be noted for many things in gas engineering history—especially for a tedious struggle against the fetish of illuminating value from the consumers' point of view. It has latterly been greatly assisted in this respect by war conditions and requirements. But although the fact has long been evident that a mere trifle—less than 5 p.ct. of the total gas consumption—is valued for its luminosity, and the testing clauses have been suspended for years, it is only in the last few months that a road towards direct abolition has been opened up by the Gas Regulation Act, 1920. Interlocked with this question is the important progress in carbonization, the introduction of the vertical retort, and steaming.

Even in 1900, it was recognized that testing for candle power was a useless superfluity that had cost users of gas (and incidentally the suppliers) sums that could well be figured in millions sterling. So I was attracted to the importance, not of candle-hours per ton of coal carbonized, but of B.Th.U., and have taken a modest share in regard to both these matters. I venture to hope that my labours have assisted in some small degree to bring along the eclipse of the photometer by calorific tests.

About half a century ago, the cast-iron retort was displaced by fireclay, chiefly because higher carbonizing temperatures were thus rendered practicable. History repeats itself; and now the well-known brands of fireclay that have served us well for many years are steadily giving place to more siliceous materials. The consequence is that we are now talking of carbonizing temperatures up to 1400° C. (outside the retort), bringing in new conditions, physical and chemical, inside the retort. I tried steaming in 1898, much on the lines now being followed in small works; but the difficulty was to get a sufficient temperature (inside the retort) to secure the complete decomposition of the steam, and to avoid the carbon dioxide trouble. The importance of these matters may be seen by comparing the best makes of gas per ton in 1914 with those recently quoted.

I was also impressed with the fact that, so far as B.Th.U. are concerned, there is a more intimate relation between the weight of the gas than the bulk. We do not talk of the calorific value possessed by solid or liquid fuels in terms of cubic feet or other measure of bulk, but in pounds avoirdupois. And experience will in all probability prove that the gas representing a "therm," as produced by any of the methods now in recognized use, is largely a factor of weight, and consequently the greater the weight of gas produced per ton of coal carbonized, the more satisfactory the result. We have seen that the former practice was in the neighbourhood of 3 to 3½ cwt. of gas per ton; but many of my working tests tell up to 5 cwt., after deducting the additions secured by the decomposition of steam, coke, or other extraneous material, and taking care not to claim more than 20 cwt. of products from 20 cwt. of coal.

THE PHOTOMETER COMPARED WITH THE CALORIMETER.

Many small gas undertakings will be called upon within the next two years to "estimate" the calorific value of the gas that they supplied during the period of 1912-14, and that without any direct data, and only a few photometrical tests with the No. 1 "London," or the No. 2 "Metropolitan" burner. All-round conditions are now so changed that the experiences of to-day offer no assistance. A comparison applied to present working is not desired, and is of little practical importance.

The figures shown in Table I. are not based on single tests, but on averages covering periods of three to six months. They include results of personal observation and extracts from reliable published sources. No useful purpose would be served by adding the names of the gas-works concerned; and in some instances the publication is not desired. They represent pre-war methods—in fact, were prepared in 1912-14. The figure for the No. 1 "London" burner is estimated by deducting 2½ candles from the average with the No. 2 "Metropolitan" burner; but this factor is subject to variation according to local conditions and the quality of the gas being dealt with.

TABLE I.

—	Illuminating Power. No. 2 M.	Calorific Value. Gross.	Calorific Value. Per Candle.	Calorific Value. Net.	Difference Gross and Net.
Intermittent verticals, no steam	15·1	549	36·6	498	51
" " "	15·6	572	36·6	515	57
" " "	15·5	562	36·2	500	62
" " "	14·8	553	37·4	495	58
" " "	15·1	559	36·9	498	61
Continuous " "	15·5	572	36·1	515	57
" " "	15·0	571	38·1	519	52
" " "	15·7	601	38·3	539	62
" " "	15·5	577	37·9	515	62
Intermittent "	14·8	572	38·7	509	63
" " steam 2 hr.	14·9	551	37·0	500	51
" " "	15·9	577	36·3	515	62
Average	15·3	570	37·2	510	60
No. 1 "London," say . . .	12·8		43·0		

An average taken on several hundreds of personal tests of gross and net calorific value shows a difference of 62·5 B.Th.U. for gases near to 15 candles by the No. 2 burner.

Reference may be made to a very complete paper, on "Coke-Oven Carbonization," read by Mr. W. Chaney before the Institution of Gas Engineers in 1913. Full particulars of analysis and composition, properties, &c., of the gas will be found therein. The specific gravity is stated as ·437; percentage of inerts, 9·3; candle power, 17·0 No. 2 "Metropolitan," 14·0 No. 1 "London"; net calorific value, 500 B.Th.U. From the composition of the gas, the gross calorific value may be taken as 560, which shows a value per candle of 33 and 40 B.Th.U. respectively. The low result as compared with the foregoing may be accounted for by the low proportion of inerts, which are known to prejudice the illuminating power to an extent greater than *pro rata*.

CONTROL OF WORKING TEMPERATURES.

Complete control of the temperatures over all parts of the retort or chamber is an essential feature of successful carbonization; and the vertical type of retort lends itself more readily to accurate control than any other pattern. The heat is distributed equally over the entire periphery at any one horizontal section, instead of being directed at an angle and playing on one half only. In the horizontal retort, for example, the heat for the most part travels at right angles to the major axis of the retort, and therefore plays on one half-section only. Mr. Dougill has recently pointed out that the vertical retort requires a smaller proportion of party-wall support than is necessary to retain a horizontal retort in a rigid position—being assisted by the standing weight, with the result that nearly three-quarters of the exterior surface can be directly exposed to the heat, against about a half with the horizontal retort; and thinner sections may also be considered. An equal heat throughout a vertical retort from bottom to top is not always desirable. On account of the necessary taper, the ratio between area and periphery is greater at the base than at the top, and may call for a higher temperature at this point if even carbonization at all parts is to be obtained. Some of the earlier designs were so defective in this respect—being hotter at top than at base—that an impression arose to the effect that vertical retorts and unequal heating were inseparably associated. The upper part of the charge would be spent in about six hours, and then have to wait for three hours or so for the remainder. After following up this subject very closely for some years, I am able to guarantee that any one part of the retort can be controlled as desired, and that without affecting other parts. So that either an even degree throughout, or any desired additional temperature at any part, can be assured.

For reasons well understood, the retorts should be worked at the highest safe temperature, having regard not to the fusing, but to the softening temperature of the material. The approach to this point is influenced by the reliability of the control.

Table II. sets forth the results of some recent tests of the working temperatures in a set of intermittent verticals, taken in the course of regular routine by an independent authority. They show that the maximum variation can be kept within 5 p.ct. In the course of tests conducted at Truro in 1918—the object being to try several samples of coal under similar working conditions, extended over some months—the greatest difference of temperature was 57° C. in the lowest chamber, 56° in the middle chamber, and 61° in the top chamber. Comparing the results with those under temperature conditions indicated by Table II., it would appear advantageous to work the bottom chamber 200° higher, and the middle chamber 50° higher, than the top chamber.

TABLE II.—*Degrees Centigrade.*

—	Bottom Chamber.	Middle Chamber.	Top Chamber.	Maximum Variation.
1 . . .	1130	1100	1070	60
2 . . .	1190	1180	1160	30
3 . . .	1240	1250	1180	70
4 . . .	1240	1250	1180	70
5 . . .	1250	1240	1200	50
6 . . .	1200	1200	1150	50
7 . . .	1230	1230	1180	50
8 . . .	1220	1210	1180	40
9 . . .	1190	1170	1140	50
10 . . .	1220	1200	1160	60
11 . . .	1290	1225	1200	90
12 . . .	1190	1180	1150	40
13 . . .	1220	1200	1160	60
14 . . .	1210	1200	1160	50

PENETRATION OF THE HEAT.

Heat as supplied to the exterior surface of the retort travels by conduction through the substance of the sides to the interior surface, and so to the charge, at a speed varying according to the difference between the exterior and interior temperatures and the conducting power. Judging by the researches of Euchène and others, the actual quantity of heat required for carbonization, as measured in B.Th.U., is not large. Therefore one is surprised

TABLE III.—*Carbonizing Systems.*

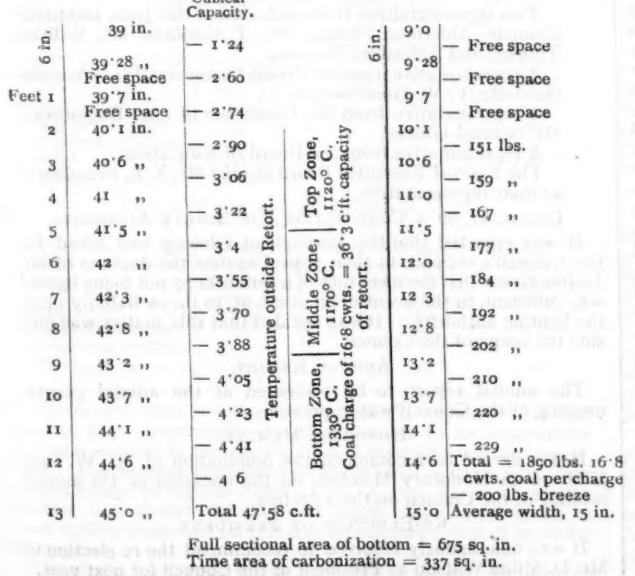
—	Length of Retort.	Sizes at Sections.			Areas at Sections.			Total Carbonizing Capacity of Retort.	Total Content Pounds of Coal per Retort (52 lbs. per Cu. Foot)	Coal Carbonized per Retort per 12 Hrs.	Carbonizing Surface per Retort.	Free Space Left over Full Charges.	Coal Less put Through Retort than Full Holding Capacity 12 Hrs.	Remarks.
		Top.	Middle.	Bottom.	Top.	Middle.	Bottom.							
	Ft. Ins.	Ins.	Ins.	Ins.	Sq. In.	Sq. In.	Sq. In.	C.Ft.	Lbs.	Lbs.	Sup. Ft	C.Ft.	P.Ct.	
Continuous	25 0	54×9	58½×13½	63×18	486	789·75	1134	137	7124	5040	300	40	29·25	All data taken from published record.
,,	20 0	30×10	33×16	36×22	300	528	792	73·33	3813	2800	163·33	19·47	26·56	
,,	13 2	17×10	20×12	22×14	170	240	308	22·22	1155	1008	71·11	2·82	12·72	About 1 cwt. breeze used before charge.
,,	13 6	22×9	24½×11½	27×14	198	281·75	378	26·41	1378	1120	81·00	4·86	18·42	Breeze charge used.
Intermittent	32 9	—	118½×19½	—	—	2301	—	523·31	27,212 = 12·14 tons	24 hrs. 21,660 960 tons	752	107	20·4	—
,,	21 0	—	36×12	—	—	432	—	63	3276	2352	168	17·7	28·20	
,,	10 0	—	24×16	—	—	322·2	—	22·37	1163	728	58·08	8·36	37·40	N.B.—The figures represent two charges in 12 hours.
,,	10 0	—	21½×15	—	—	270·32	—	18·77	976	728	52·80	4·76	25·40	
,,	9 0	—	21×15	—	—	267·68	—	16·72	869	672	47·25	3·78	22·66	
,,	10 0	—	22×16	—	—	300	—	20·83	1083	840	55·45	4·66	22·43	The figures represent two charges of 6 hours each.

TABLE IV.—*Penetration of Heat through Charges in Vertical Retorts, Chamber Ovens, Inclined, and Horizontal Retorts.*

System.	Section of Retort.	Total Time Area at Section.	Area Penetrated through Charge in Time Undergoing Carbonization.							Effective Heat Length Applied to Areas at Section.	Effective Penetration at Sections into Charge as Applied to Areas in Hours Table per each $\frac{1}{16}$ depth. Depth of Charge and Areas to Penetrate Speed Areas.							Temperature of Retort.	Remarks.
		Sq. Ins.	12	11	10	9	8	7	6	Inches.	$\frac{1}{4}$	$\frac{5}{16}$	$\frac{3}{8}$	$\frac{7}{16}$	$\frac{1}{2}$	$\frac{9}{16}$	$\frac{5}{8}$		
Continuous	Top	243	20·25	22·09	24·3	27·0	30·37	34·71	40·5	63	15·75	19·68	23·62	27·56	31·5	35·19	39·37	1000	
	Middle	394	32·9	35·89	39·48	43·87	49·36	56 41	65·81	72	18·0	22·5	27·0	31·5	36 0	40·5	46·0	900	
	Bottom	567	47·25	51·54	56·7	63·0	70·87	81·0	94 5	81	20·25	26·31	30·37	35·43	40·45	48 56	50·62	600	
Continuous	Top	150	12·5	13·63	15·0	16·66	18·75	21·43	25·0	40	10·0	12·5	15·0	17·5	20·0	22·5	25·0	600	The temperatures given are as generally published and approximate, except in case of Leeds, which are averages as taken by Fery pyrometer.
	Middle	264	22·0	24·9	26·4	29·33	33·0	37·71	44·0	49	12·25	15·31	18·37	21·43	24·5	27·56	30·62	1000	
	Bottom	396	33·0	36·0	39·6	44·0	49·5	50·5	66·0	58	14·5	18·12	21·75	25·37	29·0	32·62	36·25	700	
Intermittent	Top	85	7·1	7·7	8·5	9·4	10·6	12·1	14·2	27	6·75	8·43	10·13	11·80	13·5	15·18	16·87	800	
	Middle	120	10·0	10 9	12·0	13·3	15·0	17·1	20·0	32	8·0	10·0	12·0	14 0	16·0	18·0	20·0	900	
	Bottom	154	12·83	14·0	15·4	17·1	19·25	22·0	25·66	36	9·0	11·25	13·5	15·75	18 0	20·25	22·5	1000	
Intermittent	Top	99	8·25	9·0	9·9	11·0	12·37	14·14	16·5	31	7·75	9·68	11·62	13·56	15·5	17·43	19·37	800	
	Middle	141	11·75	12·82	14 10	15·66	17·62	20·14	23·50	36	9·0	11·25	13·5	15·75	18·0	20·25	22·5	900	
	Bottom	189	15·75	17·18	18·9	21·0	23·62	27·0	31·5	41	10·25	12·81	15·37	17·93	20·5	23·06	25·62	1000	
Chamber Oven	Rectangular 32 ft. 118½in.×19½in.	1150	48·0	50·0	52·27	54·76	57·5	60·5	64·0	137·5	34·37	42·9	51·56	60·15	68 7	77·3	86·9	1050	One charge 12 hours.
Chamber Oven	Rectangular 21 ft. × 36 in. × 12 in.	216	18·0	19·6	21·6	24·0	27·0	30·8	36·0	48	12·0	14·9	18 0	21·0	24·0	27·0	30 0	1100	Do.
Inclines	22in. × 16in. ▭	96	8·0	8·72	9·60	10·66	12·00	13·71	16·00	38	8·25	10·31	12·37	14·43	16·50	18·56	20·63	1100	Two charges of 6 hours each.
Horizontals	24 in. × 16in. ▭	101	8·50	9·26	10·19	11·32	12·74	14·56	17·00	34·85	8·71	10·89	13 06	15·24	17·42	19·60	21·78	1100	Do.
	21½in. × 15in. ▭	101	8·50	9 26	10·19	11·32	12·74	14·56	17·00	31·69	7·92	10·00	11·88	13·86	15·84	17·82	19·80	1100	Do.
	21 in. × 15in. ▭	91	7·58	8·27	9 10	10·10	11·37	13·00	15·16	31·26	7·81	9·76	11·72	13·67	15·63	17·58	19·58	1100	Do.

TABLE V.—*Intermittent Vertical Retorts.*

Full sectional area of top = 351 sq. in.
Time area of carbonization = 175 sq. in.



Full sectional area of bottom = 675 sq. in.
Time area of carbonization = 337 sq. in.

Steaming Downwards Process (Three Hours Steaming).

Depth of Retort (Applies to Coal Content Only).	Nine Hours Rate on Actual Time Sectional Area.	Effective Heat Length as Applied to Each Sectional Area.	Approximate Speed of Penetration per Hour in Depth.	Sq. Inches Approximately Penetrated per Hour.	Outside Temperature of Retort.
	Sq. In. per Hour.	Inches.	Inches.	Sq. In.	° C.
At 1 ft. down	22·5	50·2	$\frac{7}{16}$	22·0	1135
,, 2 ,,	23·9	51·2	$\frac{1}{2}$	25·6	,,
,, 3 ,,	25 0	52 0	$\frac{9}{16}$	26·0	,,
,, 4 ,,	26 5	53·0	$\frac{1}{2}$	26·5	1189
,, 5 ,,	28·0	54·0	$\frac{15}{16}$	30·3	,,
,, 6 ,,	28·9	54·6	$\frac{15}{16}$	30·71	,,
,, 7 ,,	30·4	55·6	$\frac{15}{16}$	31·27	1340
,, 8 ,,	31·7	56·4	$\frac{15}{16}$	31·72	,,
,, 9 ,,	33·2	57·4	$\frac{8}{8}$	35·8	,,
,, 10 ,,	34·5	58·2	$\frac{8}{8}$	36·3	,,
,, 11 ,,	36·1	59·2	$\frac{8}{8}$	37·0	,,

Coal = 52 lbs. per c.ft.
Breeze = 43 ,, ,,

Contents.	Cub.Ft.
Free space	6·68
Coal	36·30
Breeze	4·60
	47·58

to find the extent to which the rate of carbonization is influenced by conditions such as a comparatively small variation in the proportion of moisture, ash, or dust in the coal, or by a very slight pressure in the retort.

A vertical retort is entirely filled, with the exception of a small clearance designedly left above the charge. In horizontal retorts, loaded by machinery to the fullest extent possible, there is a larger clearance extending the whole length of the retort. With hand charging and drawing, even under skilful working, it is impossible to avoid an undesirable excess of clearance space.

Following a fresh charge, the coal in actual contact with the interior surface of the retort should take up the heat as fast as it is supplied from outside, and in turn pass the heat inward towards the centre. Some idea of the speed at which the heat moves inwards through the charge can be obtained from published investigations showing the periodical make from beginning to end. With reasonably decent coal, a maximum is quickly reached, followed by a steady decrease, indicating that the gradually accumulating thickness of coke is a poor conductor of heat. We must also remember that the weight and area of undecomposed coal undergo steady diminution from beginning to end. From the full area of the retort it comes down to vanishing point. This is peculiar to any type of externally heated retort.

The effect of physical conditions applies specially to the presence of dust. Half the troubles during the last five years have been due to the enormous increase of dust in so-called gas-coal. Apparently coal is a shocking heat conductor, and with screened or nut coal, the speed of carbonization is accelerated by radiation and convection across the interstices. The completion centre need not be coincident with the geometrical centre of the charge.

A study of the speed of penetration (say, every half hour) is, therefore, complicated and uncertain—the practical point being the time necessary to secure complete carbonization. An average speed can be calculated. No general rule can be laid down, as the speed is influenced by the initial outside temperature, and any calculation applies only to conditions similar to those existing at the time. From personal observation and published data, I have prepared the studies shown in Tables III., IV., and V., from which it would appear that the usual speed of penetration ranges between $\frac{5}{16}$ in. and $\frac{1}{2}$ in. per hour, and with down-steaming (see Table V.) $\frac{3}{4}$ in. may be obtained.

At the end of the charge, and even for some time after, the temperature does not rise to that of the exterior of the retort—showing that the passage of heat through the walls and charge is slow. In practice, the hottest part of the coke as drawn from the retort does not approach within 300° of the highest exterior temperature. With a platinum retort a close approach to equal temperatures would be rapidly attained.

AREAS OF DAMPERS, &c.

As the result of extended working experience, these have all been standardized to suit the size and number of retorts. Large settings require 55 sq. in. for the primary-air inlet; 50 sq. in. for the secondary; and for the main bench damper, 100 to 120 sq. in. For small settings the figures are 30, 25, and 50. These give a main damper pull of 0·4 in.; waste flue, 0·3; secondary, 0·2; and primary, a trifle less. A large number of tests of chimney gases average: CO_2, 17·3 p.ct.; O_2, 1·2 p.ct.; and CO, 0·2 p.ct.

Work of the American Gas Association.

The membership at Sept. 30 last of the American Gas Association consisted of 441 gas companies, 16 holding companies, 211 manufacturing companies, and 2140 active or individual members. The number of gas companies during the year ended on the date named increased 60 p.ct., the number of manufacturing companies 40 p.ct., and the number of active members 33 p.ct. So far as gas company membership is concerned, the Association have reached 100 p.ct. in several States. The organization is divided into five sections—commercial, technical, accounting, manufacturers, and publicity and advertising. Affiliation agreements exist between the Association and practically all the State and Regional Gas Associations of the United States and Canada; and official representatives of the Association have attended all the meetings held by the affiliated societies. Co-operative work with other organizations, where matters affecting the gas industry or of interest to it are concerned, is regarded as one of the most important phases of the Association's general activity. The Association "Monthly" is an excellent little publication (with a subscription rate of $3 per annum), which is a credit to all engaged in its preparation; and this is supplemented by a series of service-letters, designed to convey promptly to members information of an important nature, the publication of which could not well be delayed until the issue of the "Monthly." In addition to these, there are the numerous reprints, pamphlets, and special publications issued from time to time as occasion warrants. The demand upon Association headquarters for information and data relating to the various departments of the business has, the Secretary-Manager (Mr. Oscar H. Fogg) says in his annual report, grown beyond all expectations. There has been a notable decrease in the number of cases of misstatement and misrepresentation coming to the attention of the Association. This is attributed in part to the prompt measures taken to correct such misstatements, but more particularly to the fact that the Association's constructive publicity has made the gas industry less susceptible to misrepresentation than was formerly the case.

NATIONAL GAS COUNCIL.

Central Executive Board Meeting.

A MEETING of the Central Executive Board of the National Gas Council was held on the 14th inst., at No. 30, Grosvenor Gardens, S.W.—Mr. D. MILNE WATSON in the chair.

GAS REGULATION ACT.

It was reported that a number of applications had been lodged with the Board of Trade under section 1 of the Act, but that no Order had yet been made. It was understood that the railway companies were lodging practically identical representations with regard to pressure in relation to the calorific value of the gas, in connection with every application made under this section, and that the Council had arranged to meet these objections at the first inquiry which is held under the Act.

The publication by the Board of Trade of rules regarding applications for Special Orders under section 10 of the Act was announced, together with the fee payable with respect to such applications.

COAL.

Instances of unsatisfactory coal supplies, both as regards quality and quantity, were again cited. Great dissatisfaction was expressed that the gas industry was not directly represented upon the District Coal and Coke Supplies Committees. It was reported that the Council were continuing to press for adequate supplies of suitable coal.

SPENT OXIDE.

The progress of the investigations of the Committee of the Council appointed for this purpose was given; and an announcement was made that the National Sulphuric Acid Association had agreed to reduce the price of acid made from spent oxide from £6 2s. 6d. per ton to £5 10s. per ton, as from Jan. 1 next.

It was reported that many gas-works were in difficulties with regard to the disposal of their stocks of spent oxide, due to the fact that the users of pyrites would not at present convert their burners to the consumption of spent oxide.

RAILWAY RATES ADVISORY COMMITTEE.

It was reported that the Council had been represented at the general inquiry held by this Committee during the month of November, when it had been urged, on behalf of the gas industry, that coal and coke should be classified at the lowest rates. Some further matters affecting gas undertakings in relation to railway rates were taken up by the Council's representative at this inquiry; and Mr. S. S. Ogilvie (Assistant Manager to the Council) was thanked for his services in the matter. [The full evidence given by Mr. Ogilvie will be found in the Council's monthly report for November.]

EXCESS PROFITS TAX.

A meeting in connection with the Federation of British Industries on the 1st inst. was reported, advocating the abolition of this tax altogether.

EXHIBITIONS.

With regard to collective action being taken by the gas industry for the purpose of adequate representation at the various exhibitions held from time to time, a letter from the Society of British Gas Industries was read.

EDUCATION.

It was reported that at a meeting of the Joint Industrial Council held on Nov. 24, the desirability of co-operating with the Board of Education in drawing up a general scheme of technical education for the gas industry was considered, when it was resolved to appoint an Advisory Committee as follows:

Two representatives from each side of the Joint Industrial Council—Alderman Phillips, Mr. T. Goulden, Mr. William Thorne, and Alderman Simpson.

A representative from the British Commercial Gas Association—Mr. F. W. Goodenough.

A representative from the Institution of Gas Engineers—Mr. Samuel Glover.

A representative from the Board of Education.

The Central Executive Board elected Mr. A. E. Broadberry as their representative.

LIABILITY OF A CORPORATION FOR STREET ACCIDENT.

It was reported that the Borough of Glossop had asked for the Council's support in their appeal against the decision of Mr. Justice Greer that the mere fact of a public lamp not being lighted was sufficient, in the event of an accident, to throw liability upon the lighting authority. It was decided that this matter was outside the scope of the Council.

ANNUAL REPORT.

The annual report to be presented at the annual general meeting of the Council was approved.

HONORARY MEMBER.

It was agreed to recommend the nomination of Mr. W. Doig Gibb as an Honorary Member, on the occasion of the annual meeting of the Council on the 15th inst.

RE-ELECTION OF PRESIDENT.

It was unanimously resolved to recommend the re-election of Mr. D. Milne Watson as President of the Council for next year.

NOTES ON GAS DISTRIBUTION, WITH SPECIAL REFERENCE TO THE GAS LIGHT AND COKE COMPANY.

A LECTURE DELIVERED TO THE LONDON AND SOUTHERN DISTRICT JUNIOR GAS ASSOCIATION.

By STEPHEN LACEY, Assoc.M.Inst.C.E., B.Sc. (Eng.), Distributing Engineer to the Company.

THERE was a very largely attended meeting of members of the London and Southern District Junior Gas Association last Friday evening in the dining-hall at the Gas Light and Coke Company's offices, in Horseferry Road, Westminster, to hear Mr. Stephen Lacey, Distributing Engineer to the Company, deliver the following lecture (which was illustrated by lantern slides). Mr. FRANK J. PEARCE (the President of the Association) was in the chair, and in introducing the lecturer remarked that Mr. Lacey was a recognized authority on the subject with which he was about to deal. At the conclusion of the meeting, light refreshments were provided by the Company.

It is common knowledge that the gradually increasing use of gas for cooking and heating, both domestic and industrial, and the reduction in the gas used for lighting during the last thirty years have resulted in a more uniform rate of delivery from the works—or, expressed in another way, have increased the ratio of the average to the maximum rate of delivery. It is also generally recognized that this increase in the ratio of the average to the maximum rate of delivery has been of very great advantage to the industry both as regards the works and the distribution system, because it has enabled a unit of plant to deal with a larger volume of gas per annum. But I am not aware that any analysis has been made to determine the extent to which the industry has benefited by the greater uniformity in the rate of gas delivery, or that the bearing of the matter upon present-day developments in the manufacture and sale of gas has been fully considered.

Here we have one of the many problems that can be greatly simplified by graphical analysis. I wish, in the first place, to focus attention upon the charts shown in fig. 1—next page.

The charts contain, in graphic form, the most surprising number of facts having a bearing upon the development of the gas industry during the last thirty years; and as I propose to base most of the remarks I have to make this evening upon these and other charts of a similar character, I shall start with a rather full explanation of how they are constructed. For each of the four years 1889, 1899, 1909, and 1919, will be found plotted three distinct charts, with a common base line the length of which represents twenty-four hours from 6 a.m. on one day to 6 a.m. on the day following. The length of the ordinates or vertical offsets from a point on the base line to one of the curves represents the rate of delivery in millions of cubic feet per hour at that time. For each year the top curve in a dotted black line corresponds to the maximum day, the middle curve in full black line represents a typical winter day, and the bottom curve a typical summer day. The area between any one of the curves and the base line is a measure of the total gas delivered on the corresponding day.

TABLE ACCOMPANYING FIG. 1.—p. 696.

Maximum Days.

—	1889.	1899.	1909.	1919.
Date	Monday, Dec. 30	Friday, Dec. 15	Thursday, Jan. 28	Tuesday, Dec. 9
Weather	foggy to dull	very foggy	foggy	dull and foggy
Average temperature	33°	27°	33°	33°
Gas delivered (millions of c.ft.)	115·8	130·8	119·6	137·5

Typical Cold Clear Winter Days.

—	1889.	1899.	1909.	1919.
Date	Thursday, Dec. 12	Friday, Dec. 8	Wed'sday, Dec. 8	Monday, Dec. 8
Weather	Fine	Fair	Fair	Fine
Average temperature	35°	36°	36°	36°
Gas delivered (millions of c.ft.)	92·2	101·4	104·4	130·2

Typical Warm and Fine Summer Days.

—	1889.	1899.	1909.	1919.
Date	Wednesday, June 26.	Wed'sday, June 21	Thursday, July 15	Wednesday, July 9
Weather	Fine	Fine	Fine	Fine
Average temperature	66°	65°	65°	65°
Gas delivered (millions of c.ft.)	29·1	41·8	48·5	74·0

It will be seen from the above table that the typical winter and summer days respectively are chosen so as to be comparable with one another as regards the time of year and weather conditions. The weather conditions on the maximum days were very similar, except as regards Friday, Dec. 15, 1899, on which day the weather was abnormally cold and foggy. The consumption of 130·8 million cubic feet on this day constituted a record figure for many years.

The charts for 1889 illustrate how dependent the gas industry then was upon the lighting load. The rate of delivery during the day in the summer was little, if any, greater than the rate of delivery in the early hours of the morning, showing that the cooking and industrial load was almost negligible.

The charts for 1899 show that by that time heating of one form or another constituted a considerable proportion of the load. This is particularly noticeable in the summer; the delivery being about 50 p.ct. more than on a similar day ten years before. The maximum rate of delivery had increased, however, over that for 1889; and there was not yet a very marked improvement in the load curve for a winter's day.

Soon after the beginning of this century, the fortunes of the gas industry, and my Company in particular, began to mend; and by 1909, although the total gas delivered for the year was only 6½ p.ct. greater than in 1899, the increase in the use of gas for heating more than compensated for the reduction in the quantity used for lighting, brought about by the substitution of the incandescent gas-mantle for the flat-flame burner and by the competition of electricity. That the position of the industry had been immensely consolidated by the process is well shown by a comparison of the charts for 1909 with those for 1899. The maximum hourly rate of consumption was 8·7 million c.ft. in 1909, as compared with 10·3 in 1899—a most welcome reduction of over 15 p.ct. The increase in the use of gas-fires is well shown by the increased rate of delivery during the morning of a typical winter day; and the increase in the use of gas-cooking is unmistakably shown by a comparison of the two typical summer-day charts between 11 a.m. and 2 p.m. and at afternoon tea time.

The totals of gas delivered in 1909 and 1919 are not strictly comparable because, first, the late West Ham, Barking, and Chigwell Companies were amalgamated with the Gas Light and Coke Company in the interval, and, secondly, because the calorific value of the gas supplied in 1919 was about 10 p.ct. less than that supplied in 1909. Though these considerations affect the areas of the charts for 1919, they do not materially affect their characteristic forms. It will be seen that the rate of increase in the use of gas for cooking and heating between 1899 and 1909 was equalled, if not surpassed, during the following ten years.

The curve for the typical winter day shows the well-marked breakfast and dinner cooking loads; and the rate of delivery is so nearly uniform from early morning till late in evening that no further improvement in the general form of the curve can be hoped for in the future. The same applies to the typical summer day, which illustrates the disappearance of the summer lighting load brought about by the Summer Time Act and also the remarkable increase in the industrial and cooking load.

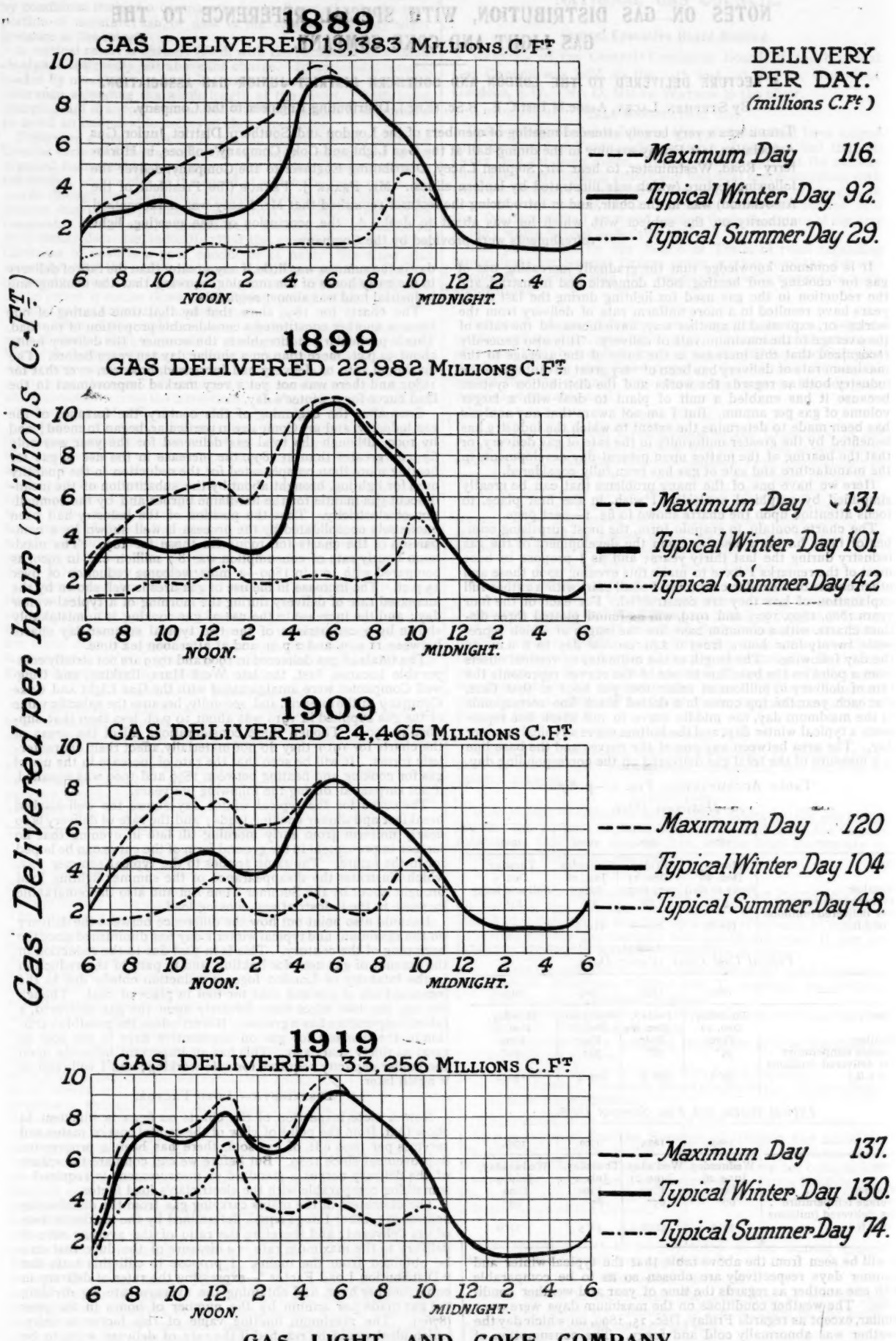
I should also point out how the difference between the delivery on the maximum and typical winter's day has diminished since the beginning of the century. This is in part due to the reduction in the amount of gas used for lighting, and in part to the reduction in the intensity of London fogs—a reduction chiefly due to the increased use of gas and coke for fuel in place of coal. Though the fog has less effect than formerly upon the gas delivered, a fall in temperature has a greater. Nevertheless, the possible variation in the demand for gas on consecutive days is not now as great as thirty years ago. This has an important influence upon the holder capacity required for safe working; and I will refer to it again later.

DISTRIBUTION LOAD FACTOR.

Now a mere inspection of the charts on fig. 1 is sufficient to show that, from the point of view of the capital cost of mains and services per 1000 c.ft. of gas sold, there has been a progressive improvement since 1889. But before we can compare the values of the delivery curves a standard of measurement is required—something comparable with the electrician's load factor.

The diameters of the mains carrying gas from the distributing centres are, other things equal, determined by the maximum rate of gas delivered; and therefore the ratio of the average rate of delivery to the maximum rate is a measure of the duty that can be obtained from the mains. I propose to call this ratio the "Distribution Load Factor"—expressing the rates of delivery in cubic feet per hour, and obtaining the average rate by dividing the gas made per annum by the number of hours in the year (8760). The maximum limiting value of this factor is unity, which ideal would be reached if the rate of delivery were to be unchanged from year's end to year's end, because then the maximum and average rates of delivery would be identical.

For each of the four years under consideration the maximum rate of delivery for the Gas Light and Coke Company as a whole



GAS LIGHT AND COKE COMPANY.

Fig. 1.—Daily Charts Showing the Rate of Gas Delivered in Millions of Cubic Feet per Hour.

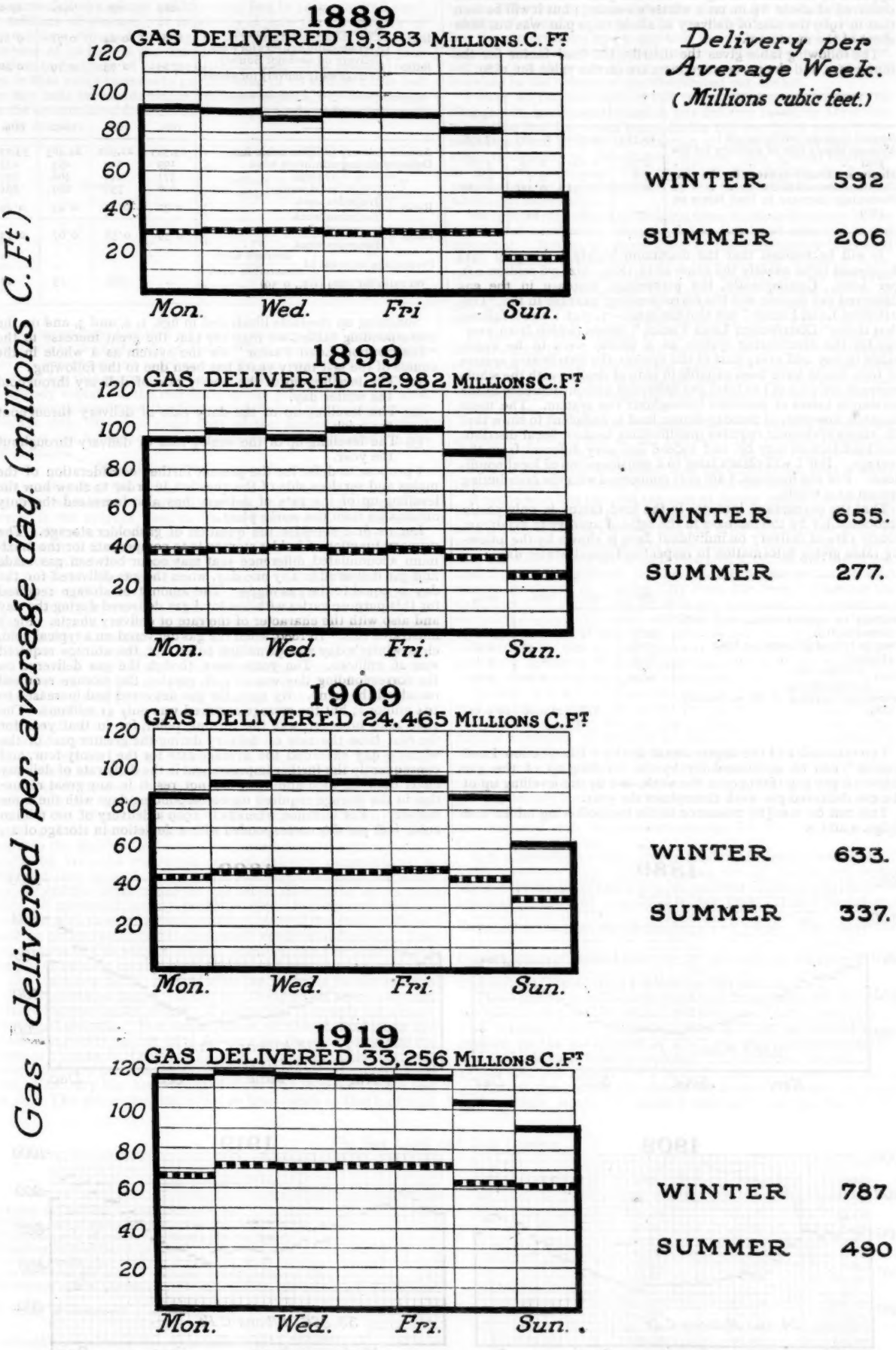


Fig. 2.—Weekly Charts Showing the Rate of Gas Delivered in Millions of Cubic Feet per Day.

appears in the charts in fig. 1. In each year the maximum rate occurred at about 6 p.m. on a winter's evening; but it will be seen that in 1919 the rate of delivery at about 12.30 p.m. was but little short of the maximum.

The following table gives the distribution load factor for the four years, and the percentage increase on the value for 1889.

—	1889.	1899.	1909.	1919.
Annual delivery (millions c.ft.)	19,383	22,982	24,465	33,256
Average hourly rate of delivery for the year	2·21	2·62	2·79	3·80
Maximum hourly delivery for the year	9·8	10·3	8·7	9·8
Distribution load factor	0·226	0·254	0·321	0·388
Percentage increase in load factor on 1889	—	12	42	72

It will be noticed that the maximum hourly delivery in 1919 happened to be exactly the same as in 1889—viz., 9·8 million c.ft. per hour. Consequently, the percentage increase in the gas delivered per annum and the corresponding increase in the "Distribution Load Factor" are also the same—72 p.ct.; and it follows that if the "Distribution Load Factor" shown (which is an average for the distributing system as a whole) were to be applicable to any and every part of the system, the distributing system of 1889 would have been capable in 1919 of dealing with the whole increase (of 72 p.ct.) in total gas delivered without increase in the maximum losses of pressure throughout the system. The mere mention, however, of Sunday dinner load is sufficient to show that the above statement requires qualification, because local distribution load factors may be, and indeed are, very different from the average. But I will return later to a consideration of local conditions. For the moment, I am only concerned with the distributing system as a whole.

That the percentage increase in the load factor is only partly accounted for by the increase in the ratio of average to maximum hourly rate of delivery on individual days is shown by the following table giving information in respect of typical winter days:

—	1889.	1899.	1909.	1919.
Delivery on typical winter day (millions of c.ft.)	92·2	101·4	104·4	130·2
Average rate of delivery per hour	3·85	4·23	4 35	5 42
Maximum " " "	9·3	10 3	8·7	9·1
Ratio $\frac{\text{average rate}}{\text{maximum rate}}$	0·41	0·41	0·50	0·60
Percentage increase of above ratio on 1889	—	*Nil*	22 p.ct.	46 p.ct.

The remainder of the improvement in the "Distribution Load Factor" can be accounted for by the levelling-up of the gas delivered per day throughout the week, and by the levelling-up of the gas delivered per week throughout the year.

This can be seen by reference to the two following tables and to figs. 2 and 3.

—	1889.	1899.	1909.	1919.
Ratio $\frac{\text{Delivery on winter Sunday}}{\text{Average daily delivery for week}}$	0·60	0·64	0·71	0·81
Ratio $\frac{\text{Delivery on summer Sunday}}{\text{Average daily delivery for week}}$	0·65	0·73	0·79	0 90

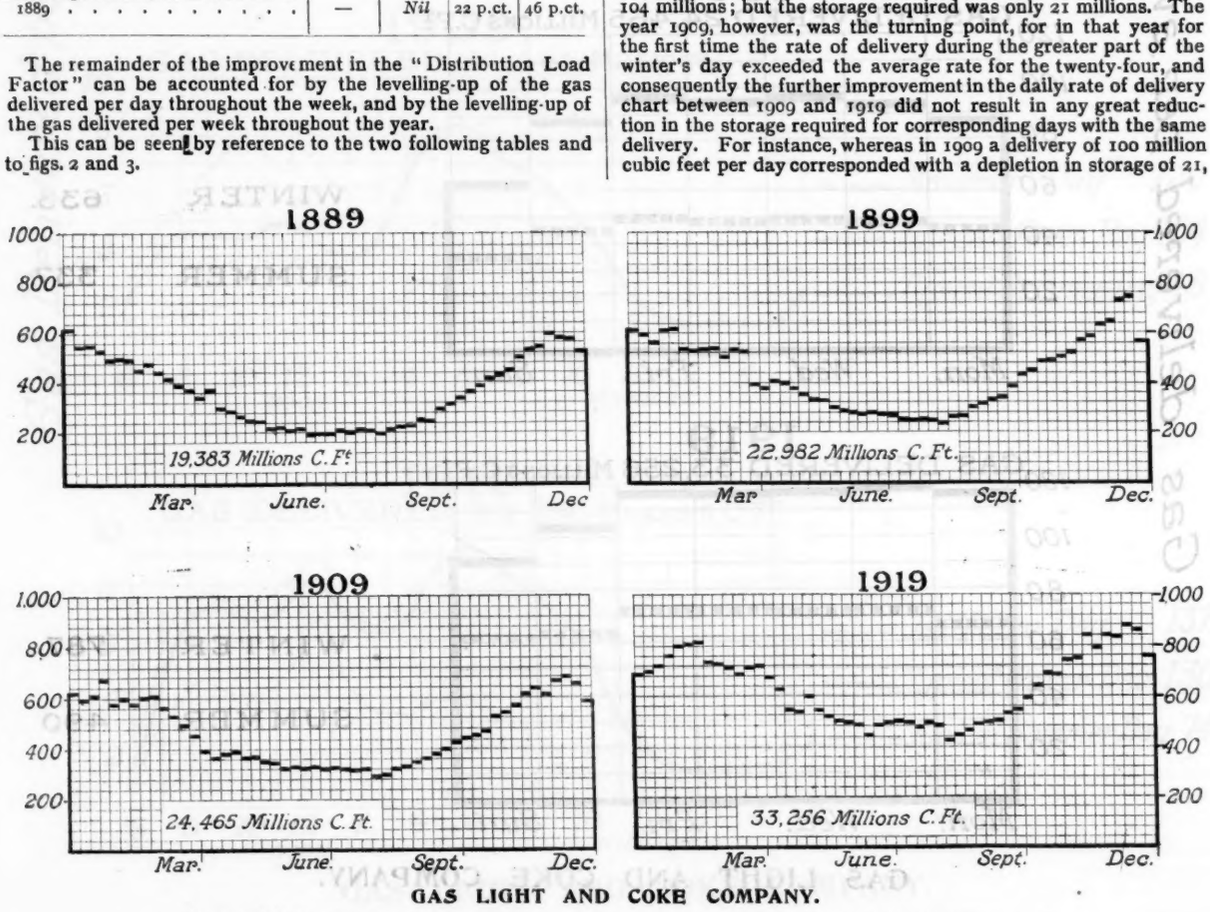
—	1889.	1899.	1909.	1919.
Annual delivery (million cubic feet)	19,383	22,982	24,465	33,256
Delivery during minimum week	199	249	293	433
" " average "	371	440	468	637
" " maximum "	626	756	689	881
Ratio $\frac{\text{Minimum week}}{\text{Maximum week}}$	0·32	0·33	0·43	0·49
Ratio $\frac{\text{Average week}}{\text{Maximum week}}$	0·59	0·58	0·67	0·72
Percentage increase of $\frac{\text{average week}}{\text{maximum week}}$ on ratio for 1889 (viz., 0·59)	..	*Nil*	13	22

Summing up the facts illustrated in figs. 1, 2, and 3, and on the corresponding tables, we may say that the great increase in the "Distribution Load Factor" for the system as a whole in the course of the last thirty years has been due to the following:

(1) The levelling-up of the hourly rate of delivery throughout the winter day.
(2) The levelling-up of the daily rate of delivery throughout the week.
(3) The levelling-up of the weekly rate of delivery throughout the year.

I propose to defer for the present further consideration of the mains and services side of the question, in order to show how the levelling-up of the rate of delivery has also increased the duty obtainable from the works plant.

Let us first consider the question of gasholder storage. The primary function of holder storage is to compensate for the maximum accumulated difference that may occur between gas made and gas delivered in any one day, when the gas delivered for the day is equal to the gas made. The amount of storage required for this purpose varies with the total gas delivered during the day and also with the character of the rate of delivery charts. Fig. 4 illustrates this. In 1889, when the gas delivered on a typical cold, clear winter's day was 92 million cubic feet, the storage required was 26 millions. Ten years later, though the gas delivered on the corresponding day was 10 p.ct. greater, the storage required remained the same. By 1909, the gas delivered had increased to 104 millions; but the storage required was only 21 millions. The year 1909, however, was the turning point, for in that year for the first time the rate of delivery during the greater part of the winter's day exceeded the average rate for the twenty-four, and consequently the further improvement in the daily rate of delivery chart between 1909 and 1919 did not result in any great reduction in the storage required for corresponding days with the same delivery. For instance, whereas in 1909 a delivery of 100 million cubic feet per day corresponded with a depletion in storage of 21,



GAS LIGHT AND COKE COMPANY.

Fig. 3.—Annual Charts Showing the Variations in the Rate of Gas Delivered in Millions of Cubic Feet per Week.

the same delivery of 100 million cubic feet in 1919 required (say) 20 millions of storage. It is worthy of note that a delivery of 130 millions required a storage of 29 millions—that is to say, an increase of 30 p.ct. in gas delivered called for a more than proportionate increase of storage—viz., 45 p.ct. The present position is that every increase in gas delivered of 10 million cubic feet per day calls for an additional 3 millions of storage to compensate for the accumulated difference between gas made and gas delivered in any one day.

Year.	Delivery on Winter Day.	Storage Called-for to Balance Variations in Hourly Rate of Delivery.
	Millions, Cubic Feet	Millions, Cubic Feet.
1889	92	26
1899	101	26
1909	104	21
1919	130	29
1920	140	32

The secondary function of holder storage is to provide for variations in the daily rate of delivery that cannot immediately be met by corresponding increases in the gas made. The storage required for this purpose has undoubtedly been reduced because, as already explained, the reduction in the proportion of gas used for lighting has reduced the difference between the maximum and average day, though a great part of the advantage so gained has been lost by the increasing influence of the variations in the temperature.

Manufacturing Load Factor.

Supposing that the works plant is just sufficient to deal with the maximum week's demand for gas, the ratio of the gas delivered in the average week to the gas delivered on the maximum week will be a measure of the duty obtained from the works. This factor is analagous to the "distribution load factor," and might be called the "manufacturing load factor."

Reference to the table on p. 698 shows that this factor for the Gas Light and Coke Company has increased since the beginning of the century by 22 p.ct., from which it follows that the annual effective capacity of a unit of the works plant has been increased by the same percentage.

To return to the application of the "distribution load factor" to the actual conditions in the distributing system. Though a "distribution load factor" applying to an area of supply as a whole is useful as a rough criterion of changes in the annual capacity of the distributing system resulting from alterations in the form of the load curve, and may be also useful as a means of comparison with other undertakings, one must constantly bear in mind that it is only an average "distribution factor." In the case of such a large undertaking as the Gas Light and Coke Company, the mean or average "distribution factor" might be high; but that would not be a measure of the duty obtainable from the mains if the different classes of consumers (such as industrial and working class) were segregated in more or less isolated districts, because the distribution factors for the individual neighbourhoods might be low—the maximum rate of delivery occurring at a different time in each. Fortunately for my Company the great majority of the trunk mains do not serve districts in which one class of consumer largely predominates. But nevertheless, in common with most other undertakings, we find the Sunday dinner load an embarrassment in some purely residential districts. The importance of this will be evident when we come to consider the supply of housing estates now in course of development.

On the other hand, parallel with the increase in the average "distribution load factor" in the last thirty years, there has been a large increase in the mileage of mains laid to supply the newly-developed districts. The consequence of this is that while the maximum hourly rate of total delivery for the Company was the same in 1919 as in 1889—viz., almost 10 million cubic feet—the hourly delivery per mile of main at the time of maximum total rate of delivery has been reduced from 5·25 thousand cubic feet to 3·7. The actual position is not so favourable as that indicated by the difference between these two figures, because of the local variations already referred to in the "distribution load factor." But it is nevertheless true to say that the mains in old-established districts are less severely taxed to-day at the maximum rates of delivery than they were thirty years ago, in spite of the very large increase in the volume of gas distributed per annum.

I have so far confined myself to an attempt to analyze the changes in hourly variations in gas delivery resulting from the revolution that has taken place during the last thirty years in the use of gas, and to show the reaction of these changes upon the effective capacity of distributing systems with special reference to my own Company. The results of the inquiry are briefly summarized in statistical form in the table at foot, with some additional information.

No special reference has hitherto been made to increases in the number of consumers, because it has not been essential to the argument. But as an illustration of the enormously increased value obtained by the community from the use of gas, it is interesting to note [see table below] that whereas in 1889, when gas was used almost exclusively for lighting, the average amount of gas delivered per consumer in the hour of maximum consumption was 45 c.ft., in 1919 the corresponding figure was 12 c.ft.

Of the facts summarized in the table, last, but not least, are those relating to £ s. d. It will be seen that the capital employed in respect of mains and services (about one-quarter of the total capital) amounted in 1919 to 2s. 6d. per 1000 c.ft. sold per annum, corresponding to a charge (at the present rate of dividend) of about 2d. per 1000 c.ft.

Having, now, some definite conception of what the distributing system is called upon to do, and with the present charge for "distribution capital" in our minds—viz., 2d. per 1000 c.ft. sold—we are in a position to consider how the distribution cost is likely to be influenced by future development of the industry.

Anyone who has counted the cost of laying mains and services to supply estates now being developed by the various municipal authorities, will have realized that the price of gas is not going to be reduced by increases in gas consumption obtained in this way. The combined effect of the increased cost of labour and materials, and the relatively small number of the houses to the acre on estates developed on Garden City lines, has been to increase the capital cost of mains and services per consumer to a positively alarming degree. The cost, which will, of course, largely depend upon the position of the estate with regard to the nearest works or distributing centre, may prove to be anything from £15 per consumer upwards, if an adequate pressure is to be maintained during the hours of maximum consumption.

To take a concrete example, suppose that the cost of mains and services to supply an estate for housing the working classes amounts to £30 per house, the permanent annual charge for capital employed on account of mains and services (reckoning interest at 7½ p.ct.) will be 45s. per annum. If, to face the worst, we assume that the only gas appliances to be installed in the houses are cookers, an estimated consumption of 15,000 c.ft. of gas per annum per consumer is reasonable. The capital charge for mains and services will then amount to 3s. per 1000 c.ft., as compared with the present average for the Gas Light and Coke Company of 2d.

It is interesting to calculate the local "distribution load factor" for this extreme case. The maximum rate of consumption would occur between noon and 1 p.m. on summer Sundays, and the average may be taken at (say) 20 c.ft. per hour. The average rate throughout the year would be $\frac{15{,}000}{8{,}760} = 1{\cdot}7$ c.ft. The "distribution load factor" would then be $\frac{1{\cdot}7}{20} = 0{\cdot}085$, as compared with 0·38 for my Company as a whole for the year 1919.

These figures conclusively show the importance of obtaining the maximum possible annual consumption from these estates. The maximum rate of consumption will not be materially increased by the installation of gas-fires, coppers, water-heaters, and incandescent lighting burners. If, therefore, instead of the 15,000 c.ft. per annum the average consumption were to rise to 45,000 c.ft. per annum, the charge for capital in respect of mains and services would be thereby reduced from 3s. to 1s. per

The Gas Light and Coke Company.

	1889.	1899.	1909.	1919.
Annual gas delivered, millions c.ft.	19,383	22,982	24,465	33,256
Average rate of delivery for the year (millions c.ft. per hour)	2·21	2·62	2·79	3·80
Maximum rate of delivery (millions c.ft. per hour)	9·8	10·3	8·7	9·8
Distribution load factor (average)	0·226	0·254	0·321	0·388
Miles of mains	1,856	2,044	2,188	2,646
Gas delivered per mile of main per annum (millions c.ft.)	10·4	11·24	11·18	12·57
Maximum rate of gas delivery per mile of main (thousands c.ft. per hour)	5·2	5·0	4·0	3·7
Number of consumers — ordinary	209,014	239,072	255,948	315,231
Number of consumers — automatic	—	114,668	330,621	514,471
Number of consumers — total	209,014	353,740	586,569	829,702
Gas sold per annum per consumer (cubic feet) — ordinary	82,004	78,983	67,874	62,771
Gas sold per annum per consumer (cubic feet) — automatic	—	14,746	12,895	19,437
Approximate maximum rate of delivery per consumer (c.ft. per hour)	45	28	15	12
Capital employed per 1000 c.ft. sold per annum, total	11s. 10d.	12s. 5d.	12s. 3d.	9s. 11d.
In respect of mains and services only	2s. 10d.	2s. 8d.	3s. 1d.	2s. 6d.
Charge for capital per 1000 c.ft. sold, total	14·28d.	12·45d.	11·88d.	7·13d.
In respect of mains and services only	3·4d.	2·7d.	3·0d.	1·8d.

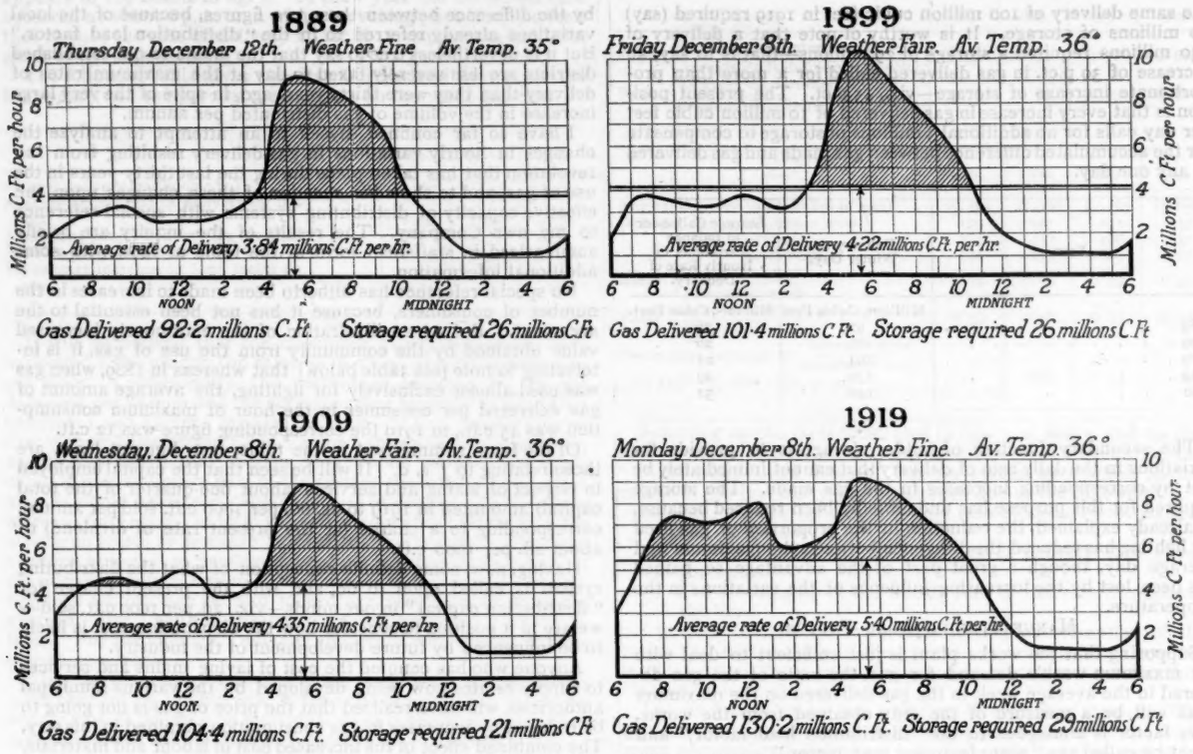

1889
Thursday December 12th. Weather Fine Av. Temp. 35°
Millions C Ft per hour
Average rate of Delivery 3·84 millions C.Ft. per hr.
NOON
MIDNIGHT
Gas Delivered 92·2 millions C. Ft. Storage required 26 millions C.Ft
1899
Friday December 8th. Weather Fair. Av. Temp. 36°
Average rate of Delivery 4·22 millions C.Ft. per hr.
Gas Delivered 101·4 millions C Ft. Storage required 26 millions C.Ft
1909
Wednesday, December 8th. Weather Fair. Av. Temp. 36°
Average rate of Delivery 4·35 millions C.Ft per hr.
Gas Delivered 104·4 millions C.Ft. Storage required 21 millions C.Ft
1919
Monday December 8th. Weather Fine. Av. Temp. 36°
Average rate of Delivery 5·40 millions C.Ft. per hr.
Gas Delivered 130·2 millions C. Ft. Storage required 29 millions C Ft
GAS LIGHT AND COKE COMPANY.

Fig. 4.—Storage Required to Balance Gas Made and Gas Delivered on Typical Winter Days.

1000 c.ft. Even this figure is very high as compared with 2d.; yet I do not see much prospect of being able to do better.

It must be remembered that I have confined myself to mains and services only, and have not touched the question of carcassing and the provision of gas apparatus for automatic consumers. The increased costs in this respect are as serious as, if not more serious than, for the mains and services. My colleague, Mr. Goodenough, the Executive Chairman of the British Commercial Gas Association, will, I hope, be able to tell us something of the efforts now being made to persuade the Government to deal equitably with the industry and existing gas consumers in this matter. It must be admitted that these considerations do not open-up a very cheerful prospect; and this applies more particularly to those concerns with large parts of their areas of supply undeveloped. It is a strange reversal of pre-war conditions, when such concerns were thought to be fortune's favourites. But it is to be remembered that all questions of cost are relative, and that the electrical concerns with their cables and the councils themselves with their sewers, are in no better case. On the contrary, they are much the worse off, for they have little or no opportunity of reducing costs by improving their load factor. I should like to say here how much I think the industry is indebted to the British Commercial Gas Association for the way in which, having accurately gauged the true situation, they straightway bent all their energies to the task of proving to those responsible for the design and equipment of new houses that the best interests of the community will be served by making the fullest possible use of gas for domestic purposes.

Fortunately for our hopes of ultimately reducing the price of gas in the future, increases in gas consumption will not in the main depend upon the development of new residential districts but upon the increased use of gas both for industrial and domestic purposes in the old-established parts of the areas of supply. For it is here that the peculiar advantages of labour saving, economy of space, ease of control, and cleanliness inherent in all gas-consuming appliances are of such importance that they more than outweigh the possible increase in direct cost as compared with solid fuel. It will be remembered that, so far as my Company is concerned (and it is probably true of most others), the mains in old-established areas are less severely taxed now than thirty years ago. Here, then, lies the opportunity for counterbalancing the inevitably high cost of supplying new estates by increased consumption in districts with a margin of main capacity.

High Pressure.

Before concluding, I must make some reference to "high pressure" as a means of reducing the capital cost of mains and services to supply new estates and of meeting increases in gas consumption in the old districts. High pressure in gas distribution may be anything from holder pressure up to 50 lbs. per square inch or more; and high-pressure distribution may mean either the distribution of gas at a high pressure up to the consumer's premises (governing down at the inlet of each consumer's meter), or it may mean the reinforcement of a system of low-pressure mains and services by high-pressure feeders.

One cannot safely generalize upon this question, because conditions vary so enormously; but one can confidently assert that, when dealing with large areas of supply consisting of a central urban area surrounded by more or less continuous suburbs which in time become themselves urban, a high-pressure feeder system is the most rational and flexible that can be adopted. When the Beckton works of my Company were built, it became necessary to lay mains to the up-town works and gasholder stations. These mains were the nucleus of what is now quite a comprehensive high-pressure system linking-up Beckton with six out of seven of the remaining works, and supplying thirteen other distributing centres, of which five are holder stations. The maximum pressure at Beckton now is 50 in.; but by next winter it will be 80 in., with a maximum delivery of 4 to 4½ million c.ft. an hour.

Since the war a similar system of high-pressure feeder mains has been laid from the Kensal Green works, which, when the pumps at the works have been erected, will have a capacity of 500,000 c.ft. per hour, at 5 lbs. per square inch pressure, and will reinforce the low pressure at five points through underground governors, which number can, of course, be increased as occasion demands.

In deciding upon what, in any particular case, is the most economical combination of diameter of main and maximum initial pressure, it is necessary to make a comparison between the cost of pumping and the interest on capital cost saved by the reduction in the diameter of the main. I cannot deal with this matter here, but would remark that the cost of pumping has not, in my opinion, been sufficiently considered when high-pressure schemes have been initiated. It is worth while to bear in mind that if, with the object of saving capital expenditure, the diameter of a main is halved, the pressure required to maintain a specified rate of delivery will be increased twenty fold.

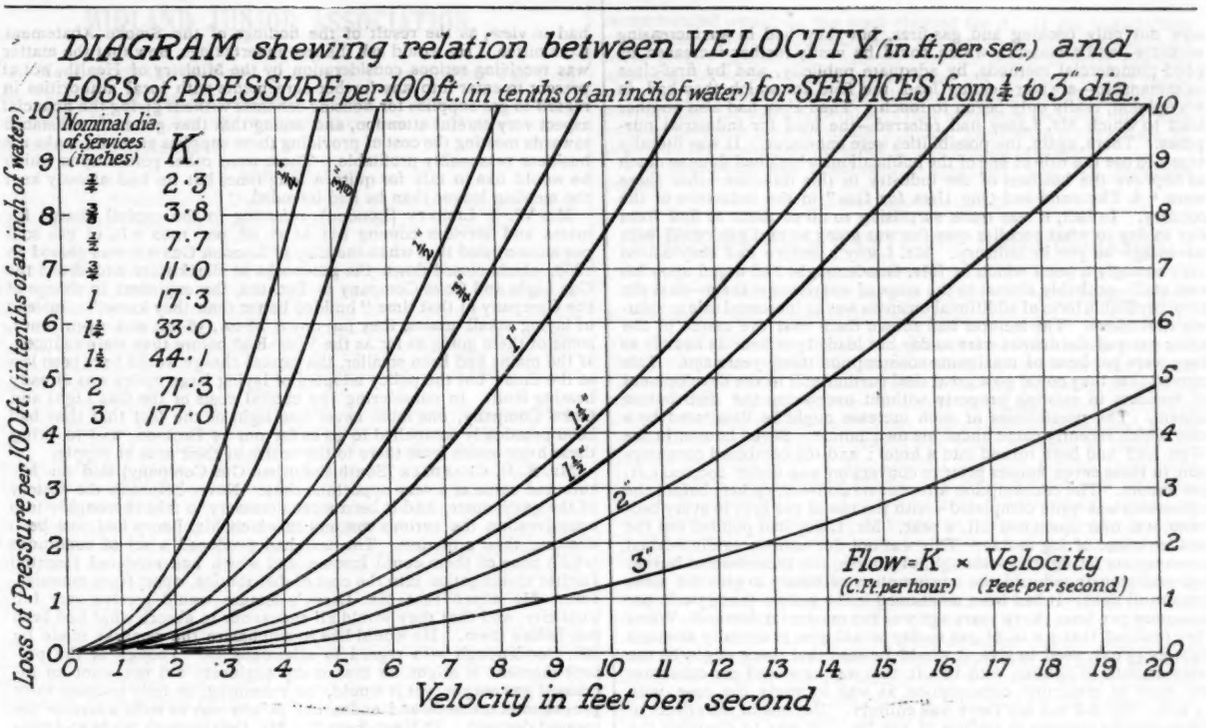
Finally, at the request of your Hon. Secretary, I have pleasure in showing two diagrams (fig. 5) giving the relation between loss of pressure, and the velocity both for mains and services. These are for the low-pressure system.

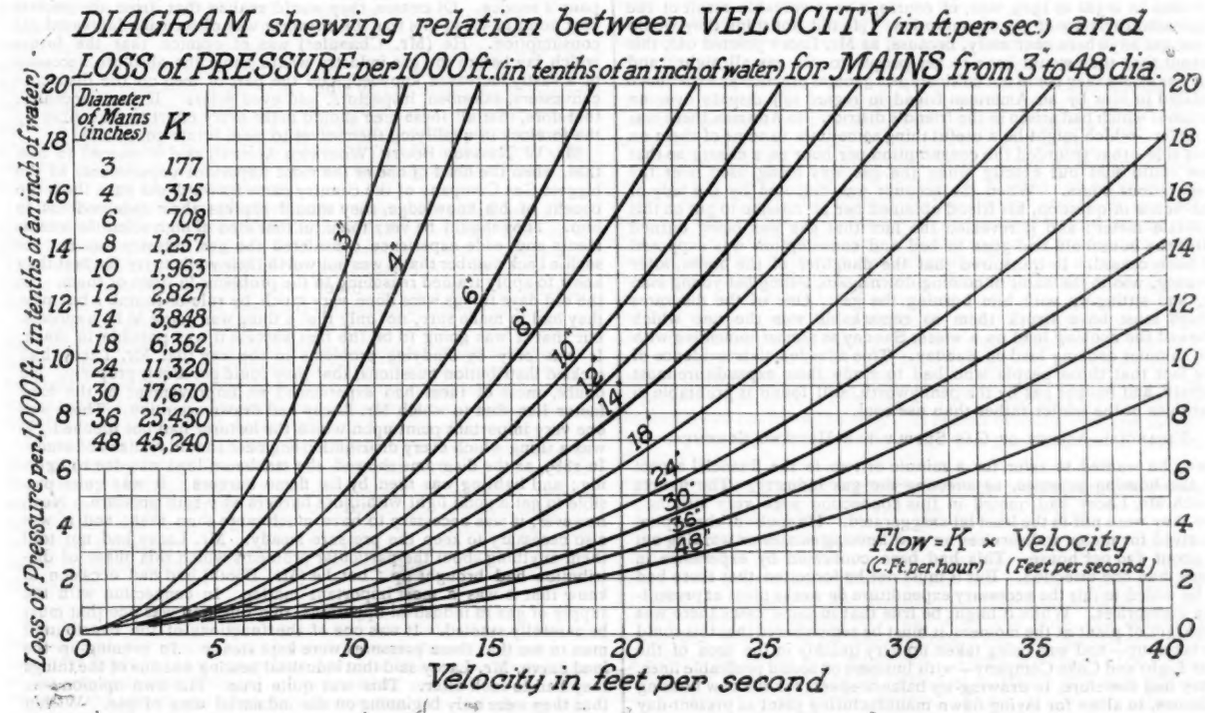
They are particularly easy to use, and can be relied upon to give sufficiently accurate results for all practical purposes. It is, of course, always to be remembered that they only hold good for clean pipes, and that a considerable margin must be allowed if corrosion or other deposits are likely to occur.

DISCUSSION.

The PRESIDENT remarked that they had listened to a most interesting and instructive lecture. The question of the distribution of gas was in these days equally as important as that of manufacturing it; and as much science could be applied to distribution as to manufacture. The diagrams which had been thrown upon the screen illustrated in a graphic manner facts which were known to most of those who had charge of works. They were all, unfortunately, acquainted with the peak loads for cooking, and at other times. The diagrams appealed to him as being exceptionally interesting, because they showed so distinctly the relationship between the load factors at various times of the day and also at various times of the year. They were very pleased to have with them that evening Mr. Goodenough, and would be glad if he would kindly open the discussion.

Mr. F. W. GOODENOUGH (Controller of Gas Sales to the Gas Light





These curves are plotted in accordance with Dr. Unwins formula (see Transactions of the Institution of Gas Engineers 1904)

Co-efficient of friction $\varphi = 0{\cdot}0044\,(1 + \frac{1}{7}d)$, *d = dia: in feet, S.G. of gas 0·5.*

In the case of Services, measured internal diameters have been used in calculation for the curves.

Fig. 5.

and Coke Company) said he would like first of all to congratulate the Association upon having had placed before them such a lucid and packed-full lecture as that which Mr. Lacey had just delivered. He thought one lesson to be learned from it was that, while it was true, as the President had said, that the science of distribution was as important as the science of manufacture, the science of sale was quite as important as either of the other two—if it was not even more important, because if they did not sell they could not make or distribute gas. It was owing to the fact that the gas industry had developed its business upon new lines through new methods that the improvement to which Mr. Lacey had been so graphically drawing their attention had taken place in the load factor, with such marked financial advantage to the industry. It was because of the very fine diversity factor which existed to-day in their business—to employ an expression made common by its use in the electrical world—that they had secured such an improved financial result; it was because they now had so many pillars upon which their business was based. They no longer depended on the one item of lighting load. There were

now not only cooking and gas-fires, but they had in an increasing measure—and a measure which could be vastly further increased by good commercial methods, by adequate publicity, and by first-class salesmanship—a water-heating load, the field for which they had, in his opinion, really only begun to touch. Then they had also another load to which Mr. Lacey had referred—the load for industrial purposes. There, again, the possibilities were enormous. It was literally true—to use the title of one of the publications which had done so much to improve the business of the industry in this direction—that there were "A Thousand-and-One Uses for Gas" in the industries of the country. In fact, it was quite surprising to all of them to find from day to day to what peculiar uses (he was going to say) gas could with advantage be put in industry. Mr. Lacey's lecture had emphasized very strongly a point which he (Mr. Goodenough) had urged upon his own staff—probably almost to the stage of weariness to them—that the most profitable form of additional business was an increased sale to existing consumers. The lecturer had shown them that the mains in the older parts of the district were to-day not loaded per hour as heavily as they were per hour of maximum consumption thirty years ago. This proved that they could go a great deal further still in the development of business in existing property without overtaxing the distribution system. The possibilities of such increase might be illustrated by a case which recently came under his own notice. Seven houses in the West-End had been turned into a hotel; and the combined consumption in these seven houses prior to conversion was under 200,000 c.ft. per annum. The consumption after conversion—or, rather, before the conversion was quite completed—with the use of gas-fires in every bedroom, was over 2,000,000 c.ft. a year. Mr. Lacey had pointed out the smaller effect of fog to-day. This was not due entirely to diminished consumption for lighting—though, of course, the incandescent burner had enormously reduced the consumption necessary to give the same amount of light. It had been mentioned in the lecture that 45 c.ft. per consumer per hour thirty years ago was the maximum demand. When they realized that 5 c.ft. of gas to-day would give practically as much light as 45 c.ft. used to give, it would be seen that there might be the same amount of lighting with 12 c.ft. that was now used per consumer per hour of maximum consumption as was formerly the case with 45 c.ft. He did not say there was entirely. But one of the effects of the enormous increase in the use of gas for fuel was to diminish the density of fogs, and so to lessen the amount of gas required for lighting during a fog. The improvement in the load factor from 0·226 in 1889 to 0·388 in 1919, was, of course, a very valuable result of the increased diversity of gas consumption. He did not think they would ever get anywhere near unity, because, as Mr. Lacey pointed out, this meant that they would have to get people to use gas all night; and he was afraid they could not cultivate as a general practice an experience related to him by an American friend in regard to a dispute over an account which had arisen in the friend's district. In America there was a meter—which might be a useful thing sometimes to some of them on this side—that recorded the consumption per hour on a chart; so that one could find out exactly when the gas was being used over the twenty-four hours. When the account was disputed by the lady of the house in question, his friend obtained her permission to put on this tell-tale meter; and it revealed the fact that gas was being burned after the household had gone to bed and consumption was supposed to have ceased. It transpired that the daughter of the house, after retiring, was in the habit of coming down again, letting her young man in, and sitting-up with him burning the gas. One of the diagrams which must have struck them as remarkable was the one which showed the cooking load on a winter Sunday as almost coinciding with the summer cooking load on Sunday. This afforded clear evidence of the fact that those people who had to study their expenditure most closely, and bought gas by the pennyworth, still found it profitable to burn gas in the winter rather than use coal.

Financial Aspect of Gas Supply for Housing Schemes.

Now, he wanted to refer for a minute or two to the financial aspect of the housing schemes, as affecting the gas industry. The figures which Mr. Lacey had quoted in this connection were very striking; but they were not in the least bit exaggerated. He spoke of the capital involved for mains and services on new housing estates as working out to about £30 per house. This had been confirmed by experience in more than one direction. But it must not be forgotten that there had to be added to this the necessary expenditure on works plant at present-day high prices. While it might be true that in some cases there was a margin of plant at the moment, it must be remembered that this could be taken up—and was being taken up very quickly in the area of the Gas Light and Coke Company—with business on sound profitable lines. They had therefore, in drawing-up balance-sheets for the new housing schemes, to allow for laying-down manufacturing plant at present-day costs to supply these estates. This would add another serious sum to the £30 Mr. Lacey had mentioned. It was necessary to reckon on at least £40 of capital per house for works and mains; and this capital had to be raised to-day at something like 8 per cent. Then the repairs and upkeep of the plant and distribution system had to be faced, at a much higher rate than formerly. He (Mr. Goodenough) had just put before the Finance Department of the Ministry of Health some figures on the subject which he thought had rather surprised them, because, in addition to the mains, services, and works, there was the higher cost of fitting-up prepayment supplies. In this connection they had to face something like £20 per house, as against £5 pre-war. Then if they wanted to increase—as they did—the capacity of the consumer to use gas, by the installation of fires and water-heaters, there was a further expenditure for apparatus which had to be met by somebody. Unless, therefore, they could get a very substantial payment made to them towards the cost of internal installation, and could either obtain payment for the mains and services that had to be laid, or reasonable interest on the cost for a considerable length of time, gas undertakings would be faced with the alternative of having to refuse a supply where the estates were more than the statutory distance from the nearest mains or works, or having to increase the price of gas to the slot consumers to an extent which would create an outcry, and probably defeat the object everyone had in view of securing the greatest possible use of gas in place of crude coal. This object the Government themselves had in view, as the result of the findings of the Smoke Abatement Committee. He would ask the gas undertakings, now that the matter was receiving serious consideration by the Ministry of Health, not at present to enter into any further agreements with local authorities in regard to gas supplies for housing schemes without giving the financial aspect very careful attention, and seeing that they got such assistance towards meeting the cost of providing these supplies as would make the business reasonably profitable. There were other points upon which he would like to talk for quite a long time, but he had already kept the meeting longer than he had intended.

Mr. W. J. LIBERTY (London), referring to the capital charge for mains and services coming out at 2s. 6d. per 1000 c.ft. of gas sold per annum, said that when the City of London Gas Act was passed in 1868, which closed-down the gas-works at Blackfriars and drove the Gas Light and Coke Company to Beckton, the engineers in charge of the Company at that time "builded better than they knew." Instead of laying small mains, they put down 48-in., 36-in., and 24-in. ones, some of them going as far as the West-End before they were reduced. If the mains had been smaller, the capital charge would have been less at the time; but the policy adopted of laying large mains was already bearing fruit. In considering the capital costs of the Gas Light and Coke Company, one must never lose sight of the fact that they had been practically compelled to go as far out as Beckton, and to bring these huge mains from there to the centre of their area of supply.

Mr. S. B. CHANDLER (South Suburban Gas Company) said the lecture had come at a very opportune time. Never before in the history of the gas industry had it been more necessary to take thoroughly into consideration the various matters to which Mr. Lacey had just been drawing their attention. The war had produced a set of conditions which none of them could foresee, and which had rendered essential further investigation into the cost of distribution, apart from manufacture. He hoped that Mr. Lacey's lecture would receive very full publicity, and that they would all endeavour to absorb what had been put before them. He would like to emphasize the remarks made by Mr. Goodenough with regard to salesmanship. Though at the present moment it might be that many engineers did not want an increased gas output, yet it would, he submitted, be folly to cease their propaganda methods and endeavour in any way to stifle a further increased demand. ["Hear, hear."] Mr. Goodenough made an excellent point when he said it was a very great advantage to increase the number of gas-consuming appliances in houses already on the company's service. Of course, they would realize that, from the capital cost point of view, this was the cheapest way of securing increased gas consumption. He (Mr. Chandler) was of opinion that the future which lay before the gas industry would show the absolute necessity of a vastly increased knowledge on the part of men on the district—canvassers, salesmen, inspectors, and even fitters. It was necessary, therefore, that all these men should make every effort to take time by the forelock in qualifying themselves to meet future conditions.

Mr. W. NEWTON BOOTH (Woolwich Arsenal) said it seemed to him that, when the head of one of the most important departments of the biggest Gas Company of the country came forward and gave them the benefit of his knowledge, they should express their indebtedness to him. They should be very thankful that men of high scientific attainments and wide experience considered the gas industry was not yet such a back number that it was not worth their while to try the best they knew to apply trained reasoning to the problems in front of them. In the old days things were done very much by rule-of-thumb; but now they had to make sure, not only that a thing was going to be a success, but that it was going to be the best success it was possible to make. It was only by studying problems in the way that Mr. Lacey had tackled distribution questions, that they could get along properly. No doubt, most of them had experienced an improvement in the load factor like that to which Mr. Lacey had drawn attention. There was one very important point upon which the lecturer had not touched. It was a thing which every distribution engineer should realize and study. In 1889, as the diagrams showed, the maximum load was due to lighting; and lighting was then by flat flame burners. It was quite possible to get a good light with those burners at 7-10th pressure. Now, however, it was necessary to have much more than that; and it was also necessary to keep the pressure steady. Mr. Lacey had not told them anything about the particular problems which this phase of distribution had brought up; but he (Mr. Booth) had had occasion to know that it was a most important matter. In connection with the supply of gas to industrial apparatus, this question was one that must be carefully studied. It was one of the functions of the distribution man to see that these pressures were kept steady. In evening-up the load curve, Mr. Lacey said that industrial heating was one of the things they had to look after. This was quite true. His own opinion was that they were only beginning on the industrial uses of gas. Within the next few years, the industrial load (in towns where such operations were carried on) would quite outweigh the other load; and what they had to realize with regard to this industrial load was that they were not supplying gas, but a heat service. It was up to them to see that the gas was used in the best possible way; and that the highest possible efficiency was obtained from the apparatus, so as to reduce the disadvantage under which gas laboured owing to its relatively high cost compared with its heating value.

Mr. LACEY, in reply, said he would like to thank Mr. Goodenough and the other speakers for their kind references to him. He did not think there was much in the points raised during the discussion which was at all of a contentious nature. Of course, it had been impossible for him in the lecture to cover the whole field; and Mr. Booth had very properly pointed out that it was necessary to maintain a constant pressure. One's difficulty in a distribution system was not altogether maintaining a constant pressure in the mains. This was not sufficient. The trouble was that there was such a variable loss in the carcassing of the buildings—more serious than the loss in the mains.

On the proposition of Mr. CHANDLER, seconded by Mr. BOOTH, a hearty vote of thanks was passed to Mr. Lacey for his lecture, to the Governor and Directors of the Gas Light and Coke Company for allowing them the use of the hall for their meeting and for their hospitality, and to Mr. Goodenough for the excellent arrangements made by him for the occasion.

MIDLAND JUNIOR ASSOCIATION.

A Meeting of the Midland Junior Gas Association was held last Thursday at the Birmingham Council House. The PRESIDENT (Mr. W. J. Pickering) occupied the chair; and there was a representative attendance.

GAS AND ITS USES.

Mr. S. W. SIMMONS (of Dudley) read a paper on the subject of "Gas and Its Uses," of which the following is a summary:

The aims and objects of the paper were to lay before all interested the facts as to the stage of development the gas industry had reached, and the services it had been capable of rendering to all branches of the community during the last century. By its representative technical organizations—be it domestic, educational, industrial, commercial—gas could play the part of a useful and faithful servant, and its increasing uses conduced to the health, comfort, and convenience of all.

The presentation to gas consumers of representative examples of the best gas apparatus and fittings now obtainable, would provide convincing evidence of the marked advance that had been made in recent years, alike in the design, efficiency, and utility of all kinds of appliance—stoves, fires, fittings, and furnaces.

If they compared the use of coal in its solid form with its use in gaseous form, they found the extended use of crude coal brought in its train the creation of vast quantities of smoke and fogs, and an unhealthy atmosphere. This matter had become so serious that a society had been formed to study the subject, and find a remedy for what was called the "smoke curse."

Gas-furnaces were used in many manufacturing processes where very delicate treatment of metals was absolutely essential. He had no hesitation in saying that, if all the advantages were taken into consideration, gas would do, as economically as coal-fired furnaces, a great deal of the work for which heat was required.

As to gas for power, they had a very large field, because it was so important that the running costs in any factory should be the absolute minimum. They had ample proof that gas-engines provided the most reliable and cheapest power obtainable.

Another field for gas was in connection with gas-heated hot-water appliances. Whatever its purpose, the apparatus was designed so as to economize labour, time, fuel, and therefore money, as compared with solid fuel. One class of consumer might prefer instantaneous water heaters, of the geyser type; another might desire a continuous supply by a circulating system with automatic gas control. It was necessary that an official test should be made of each appliance, to see that it was working efficiently, before handing it over to the consumer.

The most popular appliances gas undertakings had were the gas cooker, griller, roaster, steamer, and hotplate; and without a doubt these offered the best field for securing new consumers. This was a fact that should be appreciated to its full value, because it meant that gas employed for cooking purposes formed the greater proportion of gas used by the domestic consumer.

In dealing with the question of gas-fires, reference was made to the development from the past lump ball-fuel fires, with balls of fireclay indiscriminately pitched on to the bunsen flames, breaking their cones and causing imperfect and incomplete combustion, to the present efficient, hygienic, and beautifully designed gas-fires, which suited all kinds of decorations and styles of furnishings.

Domestic, shop, and factory lighting and heating were among the very many things for which gas was and might be used. But the future of the gas industry was in the industrial field; and it was up to all representatives of our various gas undertakings to be alive to the fact, and to fit themselves by having the full technical knowledge required of them when pushing sales of the many appliances for the use of gas for cooking, heating, lighting, and power.

DISCUSSION.

Mr. H. CLARK (Derby), in a written communication, stated that, in his judgment, the best results obtained through the use of gas by the consumer depended to a large extent upon the efficiency and reliability of the gas apparatus installed. They had not reached the desirable stage in the use of gas when distribution men felt entirely satisfied with some of the present apparatus. As to furnaces, they ought to be in a position to be able to guarantee that precisely the temperature required could be obtained. Experience showed that this could not always be done. Again, in one of the latest types of gas-fires the gas and air regulator or injector was practically useless until a fitter had spent an hour altering it. The copper circulators sometimes supplied with the capsule thermostats were too fragile. He had a sample boiling ring, intended for use with prepayment installations, which consumed 60 c.ft. of gas per hour. What was necessary was more co-operation and a closer understanding between the makers of the various appliances and the men who were responsible for selling and fixing the apparatus and distributing the gas.

Mr. W. B. COBB (Birmingham) suggested that the hot-water storage chamber should always be in the kitchen, so as to ensure secondary circulation. Warmth could thus be given to the linen cupboard upstairs, as was now achieved by the overhead tank.

Mr. R. G. MARSH (Birmingham), in moving a vote of thanks to Mr. Simmons, expressed the view that the gas-engine would hold its own for a considerable time for running costs. But the competition from electricity was very keen, and the advantages from the electric motor could not be overlooked.

The HON. SECRETARY (Mr. R. J. Bell), in seconding, agreed as to the absolute necessity of guarantees being given that the apparatus recommended would do the work claimed for it. If gas installations proved ineffective, the general use of gas for power purposes was likely to be greatly prejudiced. Although certain manufacturers supplied apparatus for which definite claims were put forward, it had rested with the gas industry itself to make the necessary improvements and adaptations. It was a hopeful sign that men were realizing that they must of necessity have adequate technical knowledge if they were to deal with the problems that arose in distribution practice.

The resolution was unanimously approved; and Mr. Simmons replied.

REDUCING GAS WASTE ON BOILING-RINGS.

Part of the waste that occurs in connection with boiling-rings, iron-heaters, and many small industrial operations is due to the gas being left burning with full flames instead of being turned down when the vessel, iron, or other appliance is removed from the heating device. Human nature is very perverse in such a matter; and human nature therefore requires some automatic means of doing the correct thing. Inventors have worked at the problem of saving gas automatically when a vessel or other appliance is lifted from a gas-heater; but the means they have devised have not hitherto gained any great measure of success. Mr. A. W. Shilleto, of 15, Laurel Avenue, Twickenham, claims to have overcome the defects in previous proposals by the method he has patented, and which can be applied not only to gas but to electrical appliances, and this by simple construction.

The plan is very ingenious, as will be seen by describing how it is applied to a gas-ring. Two brackets are attached to the lugs of the ring which support the article to be heated. On these brackets a shaft having a bell-crank lever rigidly attached is rotatably mounted. One arm of the bell-crank normally projects above the level of the supporting lugs while the other arm contacts with one end of a rod slidably mounted on the mixing-tube. The other end of the rod passes through the nozzle leading the gas to the mixing-tube, and has a valve attached to it. One end of an adapter piece is screwed into the nozzle; the other end being formed for connecting-up to the gas-supply tube. Inside the adapter piece a spring is disposed, and acts through a suitable washer to close the valve when the article being heated is removed from the appliance. In some cases a bye-pass may be arranged in the mixing-tube, so as to supply the ring with sufficient gas to retain it in the lighted condition; while in other cases the bye-pass may be arranged to supply only a single jet on the ring. The inventor prefers the former, so as to avoid extinction.

As to the action of the appliance. When a bye-pass is provided, and the gas supplied by it is lighted, on placing the article to be heated on the ring, the bottom of the former comes in contact with the arm of the bell-crank lever, depresses it, and moves the other arm of the bell-crank. This latter arm is in contact with the rod carrying the valve, and raises it off its seat, so as to admit the normal supply of gas to the ring. When the article is removed, the spring behind the valve returns it to its closed position, and the bell-crank arm to the position in which it projects above the level of the supporting lugs. The bye-pass then retains the ring in the lighted condition without waste of gas, as is frequently the case in ordinary circumstances. If required, the bye-pass can be dispensed with, so that removal of the article cuts off altogether the supply of gas from the ring. It is also obvious that the invention may be applied to all the rings of a gas-stove or to certain of them only.

Gas Statistics for the United States.

Approximate statistics compiled by the American Gas Association show that there are 1000 undertakings in the United States engaged in supplying artificial gas to the public. This number includes 43 municipal gas plants. Of these undertakings, 435 supply water gas exclusively, 247 coal gas only, 168 coal and water gas mixed, 101 oil gas, 23 coke-oven gas exclusively, and 18 coke-oven mixed with other gas. There are about 4600 cities, towns, and villages served by means of 7,329,623 ordinary meters and 1,250,657 prepayment meters. There are 68,300 miles of mains, and 125·6 meters per mile of main; the population served being 43,380,000. The estimated production of gas in 1919 was as follows: Carburetted water gas, 180,000,000,000 c.ft.; coal gas, 65,200,000,000 c.ft.; oil gas, 26,100,000,000 c.ft.; and other processes, including coke-oven gas distributed for public use, 51,000,000,000 c.ft.—total 322,300,000,000 c.ft. In these figures there is not included the coke-oven gas consumed at the point of production, or for purposes other than public use. In the table of estimated volume of artificial gas sold during the year named for various purposes, it is interesting to note that 22·28 p.ct. of the total is allocated to illumination, and 23·46 p.ct. to industrial uses. The annual consumption per meter was 34,964 c.ft. There were 71,015 persons employed by gas undertakings. As indicating the way in which business has been progressing, it may be mentioned that the estimated increase in volume of gas sold in 1920 over 1919 is 15·5 p.ct.

Before the London Section of the Society of Chemical Industry, at Burlington House, on Monday, Jan. 3, at 8 o'clock, Mr. G. H. Thurston will read a paper on the "Smith Continuous System of Carbonization."

SCOTTISH JUNIOR GAS ASSOCIATION.

(EASTERN DISTRICT)

On the 11th inst., there was a visit by members of the Association to the Dundee Gas-Works, which they inspected. The visitors were received by Mr. Alexander Yuill (the Engineer and Manager), by whom and the Corporation of Dundee they were entertained at high tea.

Afterwards, Mr. HENRY RULE, the Manager of the Kelty Gas-Works, read the following paper, the discussion of which was postponed.

EXPERIENCE WITH, AND RESULTS FROM, A TULLY PLANT.

In considering the extensions of gas-making plant, there is such a wide choice of plants that it is no easy matter to decide; so I might first of all state the circumstances that led up to the adoption of this form of gas-making plant as an auxiliary to our horizontal bench.

This latter consists of three ovens of six retorts and one oven of three; and these ovens, together with a Cornish steam-boiler (15 ft. by 5 ft. 6 in.), occupy the whole of one side of our retort-house. The other side is used as a coal-store. We have a railway siding alongside, from which the coal is emptied by hand into the coal-store. Our make of gas has gone up rapidly during the past few years, as the following figures show:

Year.	Annual Make.	Maximum Daily Make.
1914–15	28,000,000 c.ft.	116,000 c.ft.
1917–18	28,357,000 ,,	124,000 ,,
1918–19	32,873,000 ,,	130,000 ,,
1919–20	39,800,000 ,,	172,000 ,,
1920–21 (estimated at) . .	43,000,000 ,,	200,000 ,,

Last year for a short period in December we had all our retorts in operation; and my Directors asked me to report on extensions to the gas-making plant. I decided against vertical retorts for the following reasons:

(1) High capital costs. An installation suitable for us would have cost £4000.
(2) Liability of our works to subsidence due to colliery workings. This is serious matter with us.
(3) Our horizontal bench was in good order, and giving very fair results.

As our capital was only £10,000, equal in 1919 to £300 per million c.ft., we were in as favourable a financial position as any company could be; but after going carefully into figures, I could not make out a case for verticals at all. The economies to be derived from an extra yield of gas and the saving in labour were more than swallowed up by interest and depreciation.

I wish it to be clearly understood that this statement refers to our own particular case, and is not to be interpreted as applying to every works. There is a wide variation in the circumstances of different gas-works; and these must be taken into account when considering what new plant shall be installed. I decided also against further extensions of the horizontal bench for the following reasons:

(1) It was not going to eliminate the hard physical work of the stoker.
(2) No reduction on our present manufacturing costs could be expected.
(3) Coke has to be produced in horizontals, whether it is saleable or not (though at present this offers no difficulty).
(4) Capital cost of removing the existing boiler and putting up a bed of six retorts in its place, to produce about 48,000 c.ft. per day, re-erecting the boiler outside and putting a roof over it, was almost as much as water-gas plant, of a capacity of 150,000 c.ft. per day.

After visiting several different types of water-gas plants, I advised my Directors to instal one of 150,000 c.ft. per day on the Tully system; and I was led to this decision by the following advantages which this type of plant possesses:

(1) Low first cost compared with verticals or horizontals of the same capacity.
(2) Ease with which a sudden demand for gas can be met.
(3) It requires much less manual labour than horizontals.
(4) Sulphur compounds less than in horizontal or vertical retort gas.
(5) One man can make double the quantity of gas per shift as with horizontals.
(6) Maintenance and repairs less than horizontals, and more easily and quickly carried out.
(7) Reduction in costs both for labour and coal.

DESCRIPTION OF THE PLANT.

As some of the members present may not have seen the plant at work, a brief description will not be out of place.

The distinctive feature about the plant is that the blast does not travel up through the whole of the fuel; but immediately it gets to the top of the producer it passes through ports to the chequer-work outside the retort, and thence to the snift-valve, heating-up the retort walls.

The generator consists of a cylindrical steel shell, lined with brickwork. The annular space between the brickwork and steel is packed with non-conducting material. The lower portion of the plant consists of the generator and step grate; while the top portion contains the retort and chequer brickwork. Communicating with the latter at the top is the snift-valve, for up-run gas. On one side are the main and secondary air valves, and these are arranged so that the opening of the snift and the two air valves, likewise the closing of it, are done simultaneously by a wheel worked from the ground floor. On the other side of the generator is the wash-box with the up and down run, and steam valves. These latter are so connected that they work together. The opening of the down-run valve opens the steam-valve communicating with the top of the retort; and the opening of the up-run valve opens the steam-valve communicating with the bottom of the generator. Thus the fewest possible operations have to be carried out in working the plant, and any mistakes in opening or shutting the wrong valves are avoided. The wash-box is always supplied with cool water from the pump, so that there is no warping of the valves—the excess water flowing to the scrubber well. The coking door is near the top of the retort, and at a convenient height from the stage floor for easy charging. On either side of the generator, just below the retort, are two tar tuyeres with doors, injectors, and fittings, for the enrichment of the gas. We have not yet found it necessary to use these. The coal is raised to the stage floor by an elevator. A Keith-Blackman air-fan, driven by a 18·5 H.P. horizontal Keighley gas-engine with low-tension magneto, is contained in a separate room. The whole plant is in a detached building at one end of our retort-house; and here I might state that the advantages of having plenty of space around the plant are well worth any little extra expense involved in the first cost of housing.

I put in a gas-engine in preference to a steam-turbine (1) because my steam-boiler capacity was limited, and (2) it enabled me to drive the elevator from the same shafting. The space in the house above the engine-room I made into a laboratory. This contains a total-heat calorimeter, several sets of gas analysis apparatus, the pressure recording charts, a small holder, and other apparatus for carrying out the necessary tests on a gas-works. Incidentally, I might mention that the knowledge that can be obtained by having a small laboratory should make it a necessary part of every gas-works of over 20 million c.ft. per annum.

The 8-in. pipe from the outlet of the wash-box is carried outside to a tower scrubber, filled with fire-clay drain-pipes on edge. On the inlet to this scrubber, a 6-in. connection is led by a dip-pipe into the hydraulic main. The outlet of the scrubber is connected to a 50,000 c.ft. spiral gasholder.

WORKING OF THE PLANT.

In starting-up the plant first of all, some hot coke is put on the bars, and cold coke is fed in at the top, afterwards gradually increasing the depth of fuel to about half-way up the retort. When the proper temperature has been attained, coal (or whatever fuel is going to be used) is added. The same procedure is carried out when the generator is emptied for clinkering purposes. In our case, this is done once a month.

After the plant is started, it is only necessary at the beginning of each shift, to insert false bars above the step-grate, to hold-up the fuel, and drop all the clinker below it. After replacing the step-grate bars, the false bars are withdrawn; the producer doors are closed; some fresh fuel is added at the top; and the plant is ready for gas-making. The whole of this is done in little over half an hour. At night the plant is left bottled-up; and there is plenty of heat in it next morning for starting-up.

To begin with, we give a six-minutes blow, and a four-minutes run; and then work a few times with a three-minutes blow and four-minutes run. We go on then to a two-minutes blow and a four-minutes run; and ultimately two-minutes blow and three-minutes run for the rest of the period. This preliminary procedure is only necessary where the plant is worked (say) eight or twelve hours per day. Worked continuously the cycle of two-minutes blow and five-minutes run, or even of one-and-a-half minutes blow and five-minutes run could be kept up all the time. But, obviously, much depends on the quality of the fuel used. The operator puts about 2 to 2½ cwt. of fuel into the retort every hour. We usually work alternate up and down runs; but the operator may vary this occasionally. It is necessary to finish each down-run with a minute on the up-run, so as to sweep out the gases from the bottom of the generator. This avoids any explosion when the blast is turned on. During the run, we work a pressure of 40 lbs. steam for the first two minutes, and reduce to 30 lbs. the third minute, and 25 lbs. the last two minutes. It is only reasonable to expect that the temperature in the generator will fall with each succeeding minute; and therefore, to effect a proper decomposition of the steam, less must be admitted as the run goes on. In this way we have not the slightest difficulty in keeping the CO_2 content at a fairly constant figure, as will be seen from the analysis given later on. The operator can make 50,000 c.ft., elevate his own coal, clinker, and attend to oiling the engine, fan, pump, &c., in his eight-hour shift.

The blast pressure in the generator is 14 to 15 in.; and the pressure when gas-making, 6½ in. to 7 in. The holder pressure is 3¼ in.

We find that by slowing-down the speed of the gas-engine and fan during the period of gas-making, there is an appreciable gas saving. Before trying this, we used 1400 c.ft. per eight-hours shift, but now it runs to 950 c.ft.—a reduction of 450 c.ft., to say nothing of the saving in oil and wear and tear.

The coal we use principally is Aitken washed doubles non-coking, from a local colliery. The following is an analysis of it by Dr. Lessing:

Moisture	7·96 p.ct.
Volatile matter (excluding moisture)	35·76 ,,
Fixed carbon	52·10 ,,
Ash	4·18 ,,
	100·00 p.ct.

Calculated for Ash-Free Dry Coals.

Volatile matter	40·70 p.ct.
Fixed carbon	59·30 ,,
	100·00 p.ct.

Analysis of Ash.

HCl. Soluble (including water soluble)	30·70 p.ct.
,, Insoluble	69·30 ,,
	100·00 p.ct.

HCl Soluble (including Water Soluble).

Fe_2O_3	3·20 p.ct.
Al_2O_3	14·85 ,,
CaO	3·26 ,,
Undetermined	9·39 ,,
	30·70 p.ct.

It will be seen that the coal is particularly low in iron, and combined with a low ash figure this makes it very suitable for use in the plant. These analyses are borne-out by the fact that the clinker is very easy to come off. We completely emptied the generator on Nov. 16, after one month's working; and while there was a fair amount adhering to the side, it was easily taken off. The whole operation only took the attendant three-quarters of an hour. I carefully examined the brickwork of the generator and retort, and found it was almost as good as on the day on which it was first started to work, over six months ago.

An average sample of the up-run and down-run gas on a 2-minute blow and 5-minute run cycle is as follows. This was collected first into a small holder, over the whole period of the run. The apparatus used was Dr. Smith's modified form of Orsat, in which the N_2 is got direct, by passing the gas over heated copper oxide, the CH_4 and H_2 being burnt up. Hence the reason they appear both together in the analysis.

Up-Run.		*Down-Run.*	
CO_2	5·4 p.ct.	CO_2	4·6 p.ct.
O_2	0·3 ,,	O_2	0·2 ,,
CO	36·1 ,,	CO	38·1 ,,
Unsaturated hydrocarbs.	0·6 ,,	Unsaturated hydrocarbs.	0·4 ,,
CH_4 and H_2	50·6 ,,	CH_4 and H_2	49·2 ,,
N_2	7·0 ,,	N_2	7·5 ,,
	100·0 p.ct.		100·0 p.ct.
Total inerts, 12·7 p.ct.		Total inerts, 12·3 p.ct.	

Calorific value tested in total heat calorimeter:

320 B.Th.U. per c.ft. gross. | 331·8 B.Th.U. per c.ft. gross.

An analysis of the blast gases collected in the same way as above over the period of the blast shows that the quantities of air admitted at the main and secondary air valves are very correctly proportioned:

	No. 1.	No. 2.	No. 3.
CO_2	16·3	16·4	17·2
O_2	0·3	1·5	1·4
CO	1·2	1·4	0·8

We find a further advantage in making the plant act as a producer after the relief holder is full-up. The operator adds about 3 cwt. of coal to the retort; turns on a little steam; and through a separate 2-in. pipe, leading from the bottom of the up-run pipe to the hydraulic main, the exhauster pulls the gas away. The gas-making goes on in this way for about four to five hours.

First hour	Calorific Value 455 B.Th.U.	Total Heat.
Second hour	,, 400 ,,	,, ,,
Third hour	,, 384 ,,	,, ,,
Fourth hour	,, 310 ,,	,, ,,
Fifth hour	,, 263 ,,	,, ,,

The average make runs roughly to about 1500 to 1000 c.ft. per hour. This was determined by taking the make per hour on the station meter without steaming and then with steaming—the above representing the difference.

The whole plant is extremely simple, fool-proof, and presents no difficulty in working; a few days being sufficient to train a man of average intelligence. There are some points to watch about the plant; and if these are attended to, there is no difficulty in getting uniform results.

(1) Examine once a month the main and secondary air-valves and the valves in the wash-box, and clean if necessary.
(2) Any variations from the normal on the blast and gas pressures in the generator should be noted. The former is usually a sign of clinkering-up in the generator, or if the coal is a strongly caking one, the latter may indicate hanging-up in the retort.
(3) The colour of the blast gases. An experienced operator can tell from these when the temperature is hot enough to go on with the run.
(4) If a gas-engine with a magneto is the power employed, change the sparking plugs once a week.
(5) Charge the fuel into the retort at least every hour—little and often is the motto here.
(6) Have a plant of such size that it can be utilized as long as possible per day. The ideal system is to be able to work it the whole of the 24 hours, so as to get the fullest economies from it.
(7) Clinker regularly, once in eight hours; but the quality and quantity of the ash in the coal will determine this.
(8) Test the gas for CO_2 and O_2 once a week. Any increase over 5 or 6 p.ct. of CO_2 indicates an excess of steam or too low a working temperature in the plant. Any excess of O_2 indicates an examination of the valves above-mentioned. These tests are easily carried out with an Orsat apparatus in a few minutes.

REPAIRS.

One cannot tell with such a short experience what these are likely to be; but, so far, they have only amounted to some few shillings for asbestos cord and jointing; and I do not anticipate having much for a few years yet, except perhaps a producer bar or two. I am satisfied that these, however, will show a big saving compared with horizontals.

WORKING RESULTS.

As the gas made in the plant is not measured separately, and as we pass into the hydraulic main a proportion of hot gas before scrubbing, it is impossible to give tests over the whole period. Short daily tests are unreliable. The generator contains about 1 ton 15 cwt. of fuel; so that you can readily understand that over a single day's test it is difficult to ascertain how much of the fuel in the plant itself has been used up. I made a test a short time ago extending over eight days, and during that period we used exactly a wagon of Aitken washed doubles, 9 tons 5 cwt., and made 402,000 c.ft. of an average of 330 B.Th.U. gas, total heat. Deducting the coke separated-out from the clinker and used in the boiler, equalling 13 cwt., it works out at 46,744 c.ft. of gas per ton. I am satisfied that when we are able to use the plant more continuously, we shall considerably increase this figure. At present we are not able to do so, for reasons I shall deal with later. We are making 155,000 c.ft. per day of mixed gas of 470 B.Th.U., and the proportions are 105,000 c.ft. of coal gas and 50,000 c.ft. of Tully gas.

The following are our results for the past six months, compared with two separate years working on horizontals.

Mixed Gas of 470 B.Th.U., Total Heat.

Gas made per ton	12,250 c.ft.	Total B.Th.U. per ton = 5,757,300
Coke sold ,,	8·9 cwt.	
Tar and liquor ,,	48·4 gallons	

Analysis of Mixed Gas, 470 B.Th.U., Total Heat.

CO_2	4·3 p.ct.	
O_2	1·8 ,,	
CO	16·5 ,,	
Unsaturated hydrocarbons	2·4 ,,	
CH_4 and H_2	63·4 ,,	By difference
N_2	11·6 ,,	Direct
Total	100·0	

Total inerts, 17·7 p.ct.

NOTE.—Owing to the small area of the purifiers we are compelled to have an excess of O_2 to keep them clean.

	Straight Coal Gas from Horizontals. 540 B.Th.U. Total Heat. 1918-19.	Stretched Gas. 500 B.Th.U. Total Heat. 1919-20.
Gas made per ton	9030 c.ft.	10,071 c.ft.
Coke sold	8·4 cwt.	9·5 cwt.
Tar and liquor sold	48·8 gallons.	51·83 gallons.
Total B.Th.U. per ton	4,876,200	5,035,500

The quantity of coke in 1918-19 is low, due to an oven of three retorts being on for a long period. We are making all our gas just now (155,000 c.ft.) with three stokers, two barrowmen, and one man on the Tully plant. To make this quantity of gas with horizontals only we would have required six stokers and one barrowman. So the wages saving is considerable. In fact, the saving in wages per annum alone will pay 10 p.ct. on the cost of the plant. We find we can run a very uniform quality all the twenty-four hours; whereas in the old days of 540 B.Th.U. gas or stretched gas, in horizontals only, the variations were considerable. The plant has formed a most valuable adjunct to our gas-making plant, and relieved us from many labour troubles which so much harass the manager of a medium-sized gas-works.

RESULTS IN OTHER WORKS.

As showing the suitability of the Tully plant to work with various fuels, I have received from Mr. Chester, of Bale & Hardy, Ltd., some results obtained in two other works.

Works A.—Annual Make 30,000,000 c.ft.

	Horizontals.	Horizontals and Tully Plant
Gas made per ton	12,295 of 470 B.Th.U.	20,000 of 440 B.Th.U.
Coke	7 cwt.	4 cwt.
Tar	12 gallons.	5½ gallons.

In this case, owing to the peculiar position of the works, residuals were difficult to dispose of, and a low price was obtained. This made it important that as much coke and tar as possible should be gasified. The proportions of gas made were 40 p.ct. of coal gas and 60 p.ct. of Tully gas. The fuel used had strong caking properties; but a mixture of coke minimized this to a large extent.

Works B.—Annual Make 30,000,000 *c.ft.*

All gas made in Tully plant.
Fuel used two-thirds Nottingham bastard cannel and one-third Durham gas coke.
Gas made per ton 57,000 c.ft. of 380 B.Th.U. gas.

In this case, this was the only fuel available; and the horizontal bench had collapsed. The richer quality of the gas is due to the cannel in this case.

EFFECT OF LOWER-GRADE GAS ON THE DISTRICT.

In our case we have reduced our quality from 540 to 470 B.Th.U. with very few adjustments to consumers' appliances. At the same time the reduction was made very gradually—about 10 B.Th.U. at a time—so that the consumers would experience as little trouble as possible. This has proved the better way. We tried coming-down to 460 B.Th.U.; but this brought in many complaints. So we are running still at 470 B.Th.U. Certain parts of the district are only getting 2-in. pressure with 4-in. at the works, due to increasing consumption during the past three years. We are shortly laying a new feeder main to the defective district; and when this is done we shall be in a position to reduce still further our calorific value, so as to get the maximum advantages out of the Tully plants.

Every district has its own peculiarities. Some may be able to come down lower than this, without adjustment; but it is at all times advisable to see that there is an ample volume of gas in the mains, before reducing the calorific value to any large extent, no matter from what type of plant the gas is made.

Last week I took the opportunity of examining a number of meters brought in from the district, in order to see the effect of the lower-grade gas on the leathers. These were quite soft and oily, and showed no deterioration of any kind.

A sample of the tar has been analyzed by Dr. Lessing; and his report is as follows:

In the distillation of this tar, the following figures were obtained:

Water	2·5 p.ct. by weight
Oil, below 245° C.	0·4 " " "
Oil, 245° to 350° C.	47·4 " " "
Pitch	47·6 " " "
Loss	2·1 " " "

Obviously the light portion of this tar has remained in the gas.

As in my experience ordinary tar distillation is of little use in the examination of low-temperature products, I submitted the sample to the special process which is mainly based on my patent No. 130,362. The following products were obtained:

Neutral oil	42·25 p.ct.
Tar acids	19·84 "
Tar bases	1·60 "
Soft pitch	3·88 "
Hard pitch	31·76 "
Loss	0·67 "
	100·00 "

The hard pitch was composed of the following portions:

Bitumen (benzole soluble)	27·08 p.ct.
Free carbon (benzole insoluble)	4·59 "
Ash	0·09 "
	31·76 p.ct.

It should be noted that the free carbon was not exhaustively extracted, and still contained 62·94 p.ct. of volatile matter.]

The semi-solid condition of the natural oil, and the general characteristics of the products, show that this tar is a typical low-temperature one. Per ton of coal, it works out at about 7 to 8 gallons.

In conclusion, I desire to say the plant has been of the greatest assistance to us. It is of very simple construction, easy to work, and has fulfilled all my expectations. I regret that, owing to the lack of time, I have not been able to give you results, as I had intended to do, from some other fuels with a high ash content, and unsuitable from a coke point of view for use in horizontals or verticals. These I hope to try very soon; and I shall be pleased to supply particulars to anyone interested.

I should like to take this opportunity of tendering my best thanks to Mr. Tully for his kindness in giving me the necessary assistance to get the various tests carried out.

Naphthalene Solution for Motor Vehicles.—Mr. L. S. Palmer, in a paper read before the Institution of Automobile Engineers, gave the results of some experiments carried out with a view to obtaining an efficient, cheap fuel of high calorific value, and to investigate the possibility of the efficient combustion of solid fuels by means of solution. He described the manner in which road tests with a motor bicycle were carried out to ascertain the consumption of various solutions. The results appeared to show that the mileage per gallon increased only from 104·9 for pure benzole to 107·8 for a 15 to 25 p.ct. solution of naphthalene with benzole. He said that 15 p.ct. was the highest proportion found practicable without choking the carburettor with a deposit of solid naphthalene. His conclusions were that naphthalene dissolved in benzole to a strength of 15 p.ct. by weight forms an efficient fuel for ordinary petrol motors, and though about 3d. per gallon cheaper yields 3·4 p.ct. more mileage than commercial benzole. A solution, rather than a mechanical mixture, forms an efficient method by which solid or heavy liquid fuels may be conveniently burnt in ordinary internal-combustion engines.

PROGRESS OF ILLUMINATING ENGINEERING.

The Meeting of the Illuminating Engineering Society on Tuesday last week was occupied with a number of items of considerable interest—all bearing upon progress; and quite an enjoyable evening was spent over the diversified fare. Dr. LEVY was in the chair.

VACATION EVENTS.

The HON. SECRETARY (Mr. L. Gaster) made a statement as to the events of the vacation. In the first place, he mentioned that the arrangement whereby the Presidents of kindred bodies become members of the Council of the Society during their tenure of office had been extended so as to include the Society of British Gas Industries. His review travelled over to Japan, and then back to this country, where he said the National Illumination Committee had been continuing their useful work, and were at present engaged in preparing a series of definitions of the chief terms used in illuminating engineering. It was suggested that a meeting of the International Illumination Commission should be held in Paris next year, when various technical questions would be discussed. It was hoped that the subject of industrial lighting would receive very special attention, with a view to international action. The various Committees of the Society had been actively continuing their work. The Committee on Progress in Electric Lamps and Lighting Appliances, formed last year, had issued their annual report. A similar Committee to deal with Progress in Gas Lamps and Lighting Appliances (burners, mantles, glassware, fittings, &c.) had been formed by the Society of British Gas Industries to co-operate with the Society. The members of this Committee, as at present constituted, are: Mr. J. Bridger (Chairman), Mr. F. J. Gould, Mr. G. Hands, Mr. W. Mattock, and Mr. F. C. Tilley (Secretary). Provision has been made for extension by the nomination of additional representatives, if deemed necessary. It was hoped that the work of this Committee would be useful in firmly establishing the best methods of utilizing gas for lighting, and in keeping the Society informed of the latest developments. Passing over motor car lights, and cinemas and eyestrain, the next point raised was that during recent years there had been a growing demand for measurements of illumination in various fields of illuminating engineering, notably in connection with the lighting of streets, factories, &c.; and a great variety of instruments for this purpose was becoming available. It was accordingly felt that the time was ripe for the formation of a Committee, composed of members of the Society who were experts in photometry, to deal with outstanding problems connected with the degree of accuracy and methods of use of illumination photometers. A Committee for this purpose had therefore been formed; its present constitution being Mr. A. Blok, Mr. J. G. Clark, Mr. W. C. Clinton, Mr. Kenneth Edgecumbe, Mr. Haydn T. Harrison, Mr. W. J. Liberty, Prof. J. T. M'Gregor Morris, Mr. A. Stokes, and Mr. A. P. Trotter. In view of the Society being regarded as the leading authority on such matters it was hoped that the Committee would prove of value as a source to which any questions that might arise in connection with contracts or legislative recommendations involving the provision of a specified candle power or illumination might be referred. Much information followed as to industrial lighting, which showed that it is a very live subject. Incidentally it was mentioned that the Departmental Committee on the Lighting of Factories, who suspended their work during the war, had again commenced their meetings.

ELECTRIC LAMP PROGRESS.

Mr. J. W. ELLIOTT, the Secretary of the Committee on Electric Lamps, reported that they anticipated that an increasing demand would be brought about due to the large number of prospective consumers who had been waiting for the supply companies to connect them to their mains, and also by the completion of the new housing schemes, as many houses would be electrically lighted. The demand for vacuum type lamps could now be met for all standard types. Regarding the supplies of gasfilled lamps, the production had increased five or six times during the last twelve months; and the demand for most of the standard sizes could now be met. Most of the leading manufacturers were rapidly extending their production still further; and it was hoped that within a few months the supply would equal the demand for all types. In July last the range of gasfilled lamps was extended by the introduction of two new sizes—viz., 100 to 130 volt, 40 watt, and 200 to 260 volt, 60 watt.

From the demand for such lamps already experienced during the short time these new sizes had been on the market, the manufacturers were led to believe that the public were gradually becoming educated to an all-round higher standard of illumination. During the past twelve months the principal manufacturers had introduced a range of suitable fittings to suit all voltages for which such fittings were required—street lighting, works lighting, the lighting of railway termini or other large areas, and also shop-window lighting. They had also introduced a variety of small shades and bowls for use in connection with the lower wattages of gasfilled lamps, which meet a very real need for shop-window lighting and for the lighting of small areas. By these means the efficient gasfilled lamp was able to be used, the light distributed in the right direction, and all glare eliminated.

GAS-LAMP AND LIGHTING APPLIANCES COMMITTEE.

Mr. J. S. DOW read the following report from the Committee on

Progress in Gas-Lamps. It was signed by the Chairman (Mr. J. Bridger). The other members of the Committee were mentioned by Mr. Gaster, as reported above.

Recent improvements have been principally directed to increasing the efficiency in candle power of both outdoor and indoor high-power low-pressure lamps on the superheated principle by using a multiple of small burners (which dispenses with the need for inner glass cylinders), thereby reducing the cost of maintenance, which is especially important owing to the present high cost of illuminating glassware. These improvements are appreciated by gas undertakings, as also consumers.

Standardization is being carried out by manufacturers as far as possible in regard to the sizes of glassware.

With regard to the effect on gas-lamps and burners of the introduction of methods specifying calorific value, this is being met by giving a larger range of gas regulation and air adjustment, so that no differences should arise excepting under some conditions where lamps and burners are already installed. In most cases these lamps and burners can be made to act satisfactorily by slight alterations, but to make burners without air and gas adjustment is not practicable excepting for places where an even pressure is maintained.

The Committee views with very considerable anxiety the present inadequate supply and great cost of glassware and high cost of mantles, and is of opinion that should these essentials be made "key industries," the prohibition of their importation will place the gas lighting industry in an extremely serious position. Gas is the illuminant of the poorer classes, and this fact alone should be sufficient for the Government to see that traders in the gas lighting industry should not be hampered by any restriction in regard to the importation of either mantles or illuminating glassware. Otherwise they will be penalizing the very class of the community they particularly wish to protect, as incandescent gas lighting is essential to them.

Later in the evening there was a short general discussion on the matters of interest dealt with and demonstrated during the meeting. In the course of it Mr. Gaster referred to the last paragraph in the Gas-Lamp Committee's report. He said that though they could not take exception to whatever was said in the reports of Committees, of course it was a political question as to whether there should be free trade in this or that. As a Society they could not be responsible for the opinions of Committees. As a Society they could take no steps in this matter. Lamp makers who desired the importation of mantles and glassware might later come to them and desire that the importation of lamps should be stopped. This was a matter with which the Society could not be mixed up.

Opal Bulbs for Gasfilled Electric Lamps.

A demonstration was made with gasfilled lamps fitted with opal bulbs and with neon low-power lamps for positions where little illumination is required. The opal bulb fitted to gasfilled lamps hides the filament; but, nevertheless, it leasens the glare somewhat, though this is still more than we should care for at short range. It was admitted that even these lamps should not be used for domestic lighting without a shade. It is difficult to see why so much should be done to realize still higher efficiencies with electric lamps if so much trouble and expense have to be incurred in bringing about a reduction so as to make the lighting bearable, and harmless to the eyes. The neon lamps were being underrun. It was just possible to see the lamps were there when the hall was in complete darkness. The orange tint of the light was observed; but as to the illumination, the less said about it the better.

A Foot-Candle Meter.

Mr. J. S. Dow next described a foot-candle meter, which is an importation from America, being made by the General Electric Company of Cleveland. This foot-candle meter is based on an arrangement devised by Mr. Clayton H. Sharp, and has been developed to meet the demand for a light, compact, non-complicated instrument, which would measure the illumination intensities commonly found in artificial lighting installations. The instrument is so simple that anyone can operate it, so light and compact that it can be carried anywhere, so small that readings can be taken where a large photometer could not be used, and is sufficiently accurate to be of real practical value. The basic principle on which the foot-candle meter operates is simple, and may be readily demonstrated by means of a piece of white cardboard containing a small opening over which has been placed a piece of white tissue paper. If the cardboard is held between the eye and a light source, the tissue paper spot will appear brighter than the white cardboard. On the other hand, if the spot is viewed with the eye on the same side of the cardboard as the light source, the spot will appear to be darker than the white cardboard. If the illumination on both sides of the cardboard is the same, the tissue paper spot as well as the cardboard will appear to be of the same brightness.

This principle is applied to the foot-candle meter in this way: Instead of cardboard and tissue paper, the screen consists of a piece of clear glass on which are two thicknesses of paper, the one which contains round holes being fairly opaque, the other highly translucent. This screen forms one side of the light box, which is so constructed that the screen is illuminated from within to a much higher intensity at the right end than at the left. The exposed side of the screen is very nearly uniformly lighted, and the round spots appear brighter than the surrounding screen at the right end and darker at the left. It is evident that at the point where the spots change from brighter than their background to darker, the illumination on both sides of the screen is, as with the cardboard illustration, approximately the same. When the instrument has once been calibrated, the illumination intensity indicated on the screen may be read at a glance. It is obviously important that after the foot-candle meter has been calibrated, the light supplied to the screen from within must be constant for all readings, or the indications will be in error. A rheostat, or adjustable resistance, is connected in series with the lamp and the battery. This permits the voltage applied to the lamp to be maintained at a constant value as the battery gradually depreciates. When the rheostat knob is turned as far to the left as possible, the rheostat arm is automatically raised from the resistance coil, and the electrical current is broken. A voltmeter registers the voltage supplied to the lamp; and as long as the voltmeter needle is directly over the arrow on the voltmeter scale, the lamp is operating at the correct voltage to supply the proper illumination to the photometric screen. In time, the battery will have to be replaced. The lamp (of special design) is operated at a low efficiency, and will maintain its candle-power well. But it also is subject to gradual depreciation; and after a reasonable time it will have to be replaced, when recalibration is necessary.

Sheringham Artificial Daylight—Application to Gas.

Major Adrian Klein next gave an account of the improvements that have been made in the Sheringham method of producing the equivalent of daylight by artificial lights for use in matching colours, &c. When first noticed, it was in the experimental stage. The apparatus consisted of a metal conical shade upon which was mounted a paper lining coloured by hand with the necessary pigments in a simple pattern in the required proportions. Since that time, Major Klein said, the problem of production on a commercial scale has been solved successfully—not, however, without encountering a number of quite extraordinarily difficult technical problems. There were requirements which had to be met with regard to the coloured surface upon which the whole effect depends—viz., (1) The colour must be matt, (2) it must remain unaffected by the great heat generated by the high-power lamp, (3) the colours must be permanent to light, (4) the coloured surface must be washable. It was at first found that perhaps two of the conditions could be fulfilled, but never all four together; and, as a matter of fact, there did not exist (as far as research revealed) a medium with which to mix the pigments possessing the four qualifications. Finally, the difficulty was solved by the discovery by a dye chemist of a medium possessing remarkable characteristics. The pigment dries with a matt surface; the colour being nearer the brilliant purity of hue shown by the virgin powder than has been obtained by any method previously known to the arts. This medium is unaffected by any heat likely to be encountered, and after drying is not subject to change by oxidation, change of atmosphere, atmospheric pollution, and other usual causes of disintegration of paint medium. The surface may be cleaned by lightly sponging. The new medium seems to fulfil all necessary requirements. As far as the third of the four conditions is concerned, the pigments used are permanent to light. The arrangement of the colours in the form of a pattern, with each colour element in a certain proportional area, has been attained by superimposing perforated zinc upon sheets of asbestos. Thus a pattern of blue and green is simply formed. The lining of perforated zinc and asbestos is held in position by metal strips radiating from the centre. These are bolted to the shade. The bolt head and washer are coloured red—thus accounting for the third element in the coloured reflecting surface. An inverted cone has been added to the interior of the shade; and this has been found to aid in the general diffusion of the light.

The industrial unit shown by Major Klein consisted of a conical metal shade, enamelled outside, fitted with focussing top, internal diffusing cone, metal under-reflector with chains for attaching to the shade, and lampholder, with cord grip and hooks for three-point suspension. The perfection of the colouring process has effected a very marked improvement in the correction of the light. The reflection of the shorter wave lengths is greater, and the visual appearance of the light consequently whiter and a nearer approach to the north light approximate standard. A standard lamp which will be suitable for general domestic use, besides many commercial applications, is forthcoming. The application of the Sheringham reflector to gas has received consideration; and an apparatus will first be placed on the market which uses one of the more powerful gas units—probably with eight inverted mantles. An experimental unit shown a short time ago at one of the annual gas conferences was favourably commented upon. The spectra of the incandescent gas mantle being somewhat different from electric lamps, a modification of the coloured areas is necessary. The scope for artificial daylight widens daily; and Major Klein expressed astonishment at the immense variety of its application.

Lighting Railway Time-Tables.

Mr. A. Cunnington, of the London and South-Western Railway, finally gave an account of how at Waterloo Station railway time-tables are illuminated on slightly sloping stands with top lights, so shaded as to throw the light upon the tables, and hide the sources of light from the eyes of those consulting them.

Ossett and Coke-Oven Gas.—The Ossett Corporation Gas Committee have received a letter from the Ministry of Health to the effect that they will be prepared to sanction a loan of £12,280 in connection with the supply of gas from the Crigglestone coke-ovens, when the Committee have obtained new powers from the Board of Trade.

CORRESPONDENCE.

[We are not responsible for opinions expressed by Correspondents.]

Gas-Furnaces.

SIR,—I have read with interest, in your issue of the 8th inst., the report of a paper by Mr. J. M'Isaac before the Scottish Junior Gas Association (Western District); and I trust to be allowed the use of your columns to make a few comments by way of addition to the discussion that took place in this connection.

Mr. M'Isaac proposes that furnaces should be classified under the following headings: Natural-draught furnaces; forced-draught furnaces; compressed gas or air furnaces.

I do not think we should accept such a classification, because it does not take into account the considerations which govern the percentage of heat generated by the gas which is available for the functions of the hearth—thereby indicating the possible and probable relative efficiency of the various types of furnaces.

Unless some form of regeneration is applied, the percentage of the heat generated by the gas available for the functions of the hearth in furnaces, and in reference to any particular gas, will be the same for any given temperature, irrespective of the manner in which the gas and air are supplied to the furnaces. Whether it is natural draught, forced draught, or compressed gas or air, will make no difference to this percentage so long as the construction of the furnace is correct for the particular application adopted, and so long as the relationship of the gas and air is reasonably correct.

Taking the case of a typical 500 B.Th.U. gas commonly supplied until quite recently, consuming 4·25 c.ft. of air to 1 c.ft. of gas for combustion, the following table indicates the percentage of the heat generated by the gas which will be available for the functions of the hearth at various temperatures; and it will be noted that the percentage so available becomes less and less as the temperature gets higher and higher:

Working Temperature of Furnace.	Percentage of Heat Generated by Gas Available in the Hearth.
200° C. ..	92·2
400° C. ..	83·4
600° C. ..	74·9
800° C. ..	65·5
1000° C. ..	55·2
1200° C. ..	44·5
1400° C. ..	33·1
1600° C. ..	21·5
1800° C. ..	9·3

These percentages for this particular gas will remain constant with a furnace of the non-regenerative type, assuming that the temperature of the hearth and the temperature of the escaping gases leaving the hearth correspond, which may generally be considered as being so under practical conditions.

The next point to which I should like to make reference is the suggestion that for all temperatures up to and including 1000° C., natural draught furnaces should be used; but over this temperature (up to 1500° C.), forced-draught furnaces should be used. Here, again, I find it difficult to get into line with Mr. M'Isaac's ideas.

Truly [regenerative systems, as distinct from regenerative systems so-called, have not been found successfully to operate with rich coal gas under natural-draught conditions; and in almost every case where a regenerative furnace has been successfully developed, it operates in some way on a forced-draught system. I am well aware of the good service that has been obtained by the so-called natural-draught regenerative furnaces as supplied by the Davis Furnace Company, the Richmond Gas Stove and Meter Company, and Messrs. John Wright & Co. These furnaces are all substantially the same in principle, and apparently give practically the same results in practice; but they are not truly regenerative. The air required for combustion—or at least a portion of it—is supplied pre-heated. The heat conveyed to this air, however, is mainly obtained at the expense of the hearth, and only a small proportion of the heat contained in the in-going air is derived from heat which would otherwise be lost by radiation from the bottom of the furnace; and it is only to this latter, and smaller, extent that the furnaces can be considered as regenerative in action.

Mr. M'Isaac's suggestion that natural-draught furnaces should be used for all temperatures up to 1000° C., would exclude the truly regenerative systems up to this temperature. I cannot possibly accept such a suggestion, in view of the beneficial effects of regeneration upon the percentage of heat generated by the gas available in the hearth.

I will take Mr. M'Isaac's figure of 1000° C., and again refer to the 500 B.Th.U. gas already quoted. At 1000° C. in a non-regenerative furnace, the percentage of energy available for the hearth is 55·2, as already indicated. The table below shows the influence of preheating the air to various temperatures upon the percentage of energy so available, in reference to a furnace consuming 500 B.Th.U. gas and operating at a temperature of 1000° C.

Air Heated to	Percentage of Heat Generated Available for the Hearth.
0° C. ..	55·2
200° C. ..	61·4
400° C. ..	67·8
600° C. ..	74·5
800° C. ..	81·3
1000° C. ..	88·5

This table, in my opinion, fully justifies the classification of furnaces in accordance with the regenerative system adopted, if any; and I would suggest, as an alternative classification, the following:

(*A*) Non-regenerative furnaces subdivided into:
- (1) Natural draught,
- (2) Forced draught (air under pressure),
- (3) Induced draught (gas under pressure).

(*B*) Natural-draught preheater furnaces (of the type usually classified as natural-draught regenerative furnaces), typical examples of which are the Davis Furnace Company's, the Richmond Gas Stove and Meter Company's, and Messrs. John Wright and Co.'s natural-draught regenerative series.

(*C*) Recuperative furnaces (air under pressure).

This classification will refer to the types of furnaces in which air for combustion passes on its way to the combustion chamber through a series of tubes—these latter being heated by the escaping products. Typical examples of this class of furnace are the Davis Furnace Company's counter-current, the Richmond Gas Stove and Meter Company's "L.P.G.A.," and Messrs. John Wright and Co.'s "Lo-Press."

(*D*) Regenerative furnaces (air under pressure).

In this class of furnace double regenerators are used, acting alternately as heat accumulators and air preheaters, each function being performed by direct contact of the refractory materials with the waste gases and incoming air alternately. A typical example is the Davis Furnace Company's "Revergen" furnace.

There are various points of minor interest in Mr. M'Isaac's address to which I should like to make reference, but should not feel justified in trespassing further upon your space.

THE DAVIS FURNACE COMPANY,
W. R. TWIGG, Technical Manager.

Luton, Dec. 16, 1920.

Therms and Consumers' Accounts.

SIR,—I was much interested in the letter of Mr. Topley, the Secretary and Accountant of the Croydon Gas Company, in your issue of the 8th inst. and your article upon it in the last issue of the "JOURNAL." As you state that "criticism, even though adverse will give no pain to Mr. Topley," I venture to add the following comments.

Mr. Topley writes of "a form of account which shows the index readings and quantity registered as consumed, and also the price per therm—provided that the measure of conversion from volume to therms is intelligibly explained. . . ." Exactly, but is it so in Mr. Topley's "imaginary account?" I maintain that there is just enough information in the account and attached note to bewilder the consumer. He is about to buy "heat," not "volume," and is entitled to know how many therms he is paying for, as though he were buying "yards," "pounds," or "tons," without having to turn the money back into cubic feet *via* therms at the prescribed rate of B.Th.U. as per note attached to the account. This, if one would or could do so, is made more complex by the introduction of the decimal point—*i.e.*, 1s. 1·6d. Why not 1s. 1½d. and so help the consumer?

Mr. Topley refers to "the relatively small number of consumers who do in practice verify before payment." Surely his proposed method of charge would reduce the number to the vanishing point; and it should be to the interest of every company to cultivate a feeling of satisfaction and confidence between themselves and the consumer. Even Mr. Topley introduces another formula to assist in working-out the price per cubic foot—viz., 13·6 × 4·7 or 63·92d. But this information is only for office use; it is not on the account, and if so would only still further befog the poor consumer.

A simpler form of index reading card and account would be as follows:

METER READING INDEX CARD.

Date.	Index.	Difference.	Therms.		British Thermal Units.
			Half Quarter.	Quarter.	
1921.					550
March 17 . . .	205·600	..			
April 30 . . .	215 000	9 400	51·700	85·25	
June 17 . . .	221·100	6·100	33 500		

MIDSUMMER QUARTER, 1921.

To gas supplied June 30.
15·500 c.ft. = 85·25 therms at 1s. 1½d. per therm £4 15 11

NOTE.—The calorific value of the gas declared by the Company is 550 B.Th.U. per cubic foot.

* 15,500 c.ft. × 550 and divided by 100,000 = 85·25 therms.

* Or any other figure as an example.

The additional columns for "Therms" in the ledger is a small item. A calculation table, giving feet in terms of therms, will have to be provided for the use of the clerks in every case to avoid workings-out.

As Dr. Carpenter so pithily put it recently in the "JOURNAL:" "Consumers should come before accountancy." There is an economy which does not always pay; and in these days of competition the convenience of the consumer "must be sedulously sought after in every practical direction." So drop the decimal point in the standard and selling price in favour of the ¼d. as the multiple, Mr. Topley.

Dulwich, S.E.,
Dec. 18, 1920.

W. J. LIBERTY.

Industrial Gas Heating.

SIR,—With regard to the letter of Mr. Cyril G. Davis (of the Davis Furnace Company), published in the correspondence columns of the "JOURNAL" dated the 15th inst., in which reference is made to my recent paper on "Industrial Gas Heating," and exception is taken at my not having quoted actual comparative figures of gas consumptions in the case of the "Revergen" furnace and other types of furnaces, I would mention that in my opinion the publication of any such data should be qualified by giving full details as regards the particular application, time of operation, and other essential details affecting the heating process; otherwise such figures might be useless or even misleading.

In the short time at my disposal in the summary referred to, it was

quite impossible for me to give any comparative figures; and, further, I would mention that the full paper, which is at present in the hands of the British Commercial Gas Association and which contains much more detailed information in this connection, has not yet been published *in extenso*.

While, from the results of tests which have been carried out on the "Revergen" type of furnace, I have no doubt that the figures published by the Davis Furnace Company are correct in every respect, nevertheless I consider that in the publication of figures of this kind further details should be given in regard to the actual furnaces, rate of working, &c., in order that they may be comparable with other designs of similar apparatus.

I think the complaint of Mr. Davis is quite unfounded; and I am sure that the Davis Furnace Company will receive the credit due to them in placing before the industry a design of furnace which undoubtedly has many points to recommend it, and at the same time is associated with efficiencies very much higher than any hitherto obtained. At the same time, I am of opinion that these efficiencies, high as they are, will be still further increased with a fuller knowledge of the recuperation of waste heat in the town's gas heated furnace.

Birmingham, Dec. 20, 1920. C. M. WALTER.

REGISTER OF PATENTS.

Lighting and Extinguishing Gas Street Lamps. No. 139,501.

BERNARD, P. M. E., of Boulogne-sur-Seine and BARBÉ, M. V., of Paris.

No. 5759; Feb. 25, 1920. Convention date, Feb. 19, 1919.

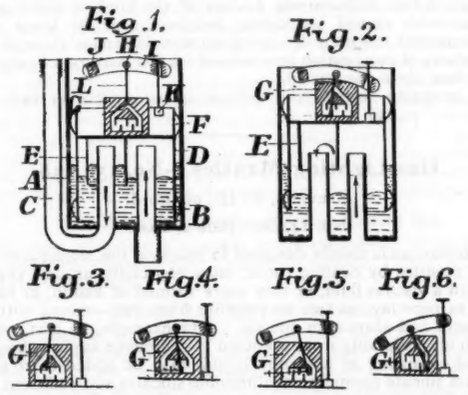
This apparatus comprises a cup containing a sealing liquid and a bell movable therein, in such a manner as to control the flow of gas from an inlet to an outlet pipe leading to burners provided with ignition bye-passes, when the apparatus is subjected to pressure surges of the gas supply. The position of the bell under pressure surges is determined by mechanism including cam surfaces or members with projections and parts adapted to engage therewith, whereby full illumination followed by partial illumination and then by complete extinction (or other desired sequence of events) can be obtained.

According to the invention, a suitably shaped part with grooves and projections is attached to the top of the bell, and with the grooves engages the bent point of a rod secured to a balance-beam oscillating about a suitably arranged spindle—the beam being balanced for certain positions of the bell and its equilibrium disturbed for other positions of the bell.

The members with projections are of different forms to suit the particular sequence of events desired. Thus, when three pressure surges are sent—one at the lighting-up time, one at midnight to reduce illumination, and one at daybreak to extinguish all the lights—the burners which are to remain alight all night are equipped with one form of member, and the burners which are to be extinguished at midnight are equipped with a correspondingly different form. A form of member operated by two pressure surges only is also provided.

In carrying out the invention, means are provided for disturbing the equilibrium of the beam at the desired instant. This consists of a weight suspended by a link to the beam balanced by a balance-weight on the beam—the parts being so arranged that, when the bell is raised by the surge of pressure, the weight suspended by the link rests on the upper part of the bell and destroys the equilibrium of the beam.

Furthermore, when glycerine is used as the sealing liquid, the apparatus preferably comprises a mercury cup mounted at the end of the gas outlet tube to form a mercury seal at this point of the apparatus—the glycerine forming a seal between the cup and the bell.



Bernard and Barbé's Lamp Lighter and Extinguisher.

Fig. 1 is a vertical section of the apparatus; the bell being in its low position. Fig. 2 is a vertical section of the apparatus; the bell being in its raised position. Figs. 3 to 6 are detail views chiefly showing the parts in the different positions they can occupy.

The apparatus comprises a cup A, containing mercury or other liquid—mercury being preferred as it makes it possible to reduce the size of the apparatus. Through the cup passes a tube B (to which is connected the gas supply pipe) and a tube C, extending to the burner or burners controlled by the apparatus. A bell D, under which is secured a tube E, dips into the cup; and round the bell are arranged six ribs F—three each at the top and bottom. They guide the bell in the cup and prevent the walls adhering to the cup A. Parts G, forming a frame with grooves and stop notches, are secured at the top of the bell. They are interchangeable, according to the kind of lighting to be obtained. A rod H, passing right through the upper part of the cup, forms an axis for a balance beam I. One side of the beam carries a weight J; the other side is connected by a rigid or flexible link to a movable weight K, which is heavier than the balance-weight J. In the centre of the beam I is secured a rod L with a bent point which engages with the grooves of one of the parts G.

The working of the apparatus is brought about by surges of pressure in the gas supply of at least 10 mm. above the highest accidental pressures that could take place in the piping—that is, by rises followed by return to normal pressure. The bell is provided with ballast in order that it should be unable to rise except under the action of the desired excess of pressure, in accordance with the pressure of each burner. The excess of pressure can be slow or quick. The working of the apparatus will vary in accordance with the shape of the part G used—four different arrangements are shown in figs. 3 to 6.

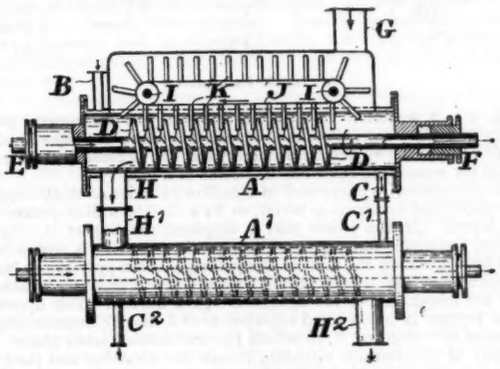
Low-Temperature Distillation of Coal.—No. 144,712.

LÖWENSTEIN, KARL ZU, of Berlin, IRINYI, A., of Hamburg, and KAYSER, T., of Berlin.

No. 15,778; June 10, 1920. Convention date, Oct. 28, 1918.

In the low-temperature distillation of coal and similar bituminous substances for the purpose of obtaining oil and tar—particularly so-called low-temperature tar—rational working on a large scale has (say the patentees) been beset hitherto by the difficulty of an adequate gasification of the coal, caused by the thermal conductivity co-efficient of the coal. There was also the disadvantage of the easy liability to decomposition or splitting of the distillation products, formed before they could be obtained.

According to this invention these disadvantages are obviated by the fact that coal, which is preferably broken up to the size of nuts, is so passed along uninterruptedly in small layers past heating walls that "all particles of the material to be coked are continuously and uniformly heated on all sides." For this purpose there is used, in combination, a double-walled externally heated retort, as shown.



A German Low-Temperature Distillation Plant.

A is a double-walled trough (from which air is excluded) to which the heating agent is supplied at B, while the outlet is at C. D is a central screw which, as regards its shaft and also its blades, is made hollow, so that the heating agent which enters at E can only escape at F after it has passed through the hollow blades of the screw.

The coal which is fed in at G is travelled by the conveyor screw in thin layers, the particles of which, while being disintegrated and turned, are heated uniformly on all sides and fed to the outlet H. In order to prevent the particles of coal from baking on to the walls of the blades of the screw, scrapers may be provided in such a way that an endless band J, running over shafts I, is provided with ribs K, which, moving forward in proportion to the rotation of the screw, rub along the walls of the blades and so automatically act as scrapers or strippers.

If necessary, there may be connected a similarly constructed second retort A^1 in order, if so desired, to carry out the preliminary gasification of the coal in the first retort and the completion of the coking in the second. In this case, the second screw may run the opposite way to the first retort, so that then the outlet H from the first retort is connected to the inlet H^1 to the second retort, and the heating agent which quits the first retort at C would have to be transferred into the supply pipe C^1 for the second retort. The finally gasified coal is then carried away at H^2, and the heating agent at C^2.

Calorimeters.—No. 145,437.

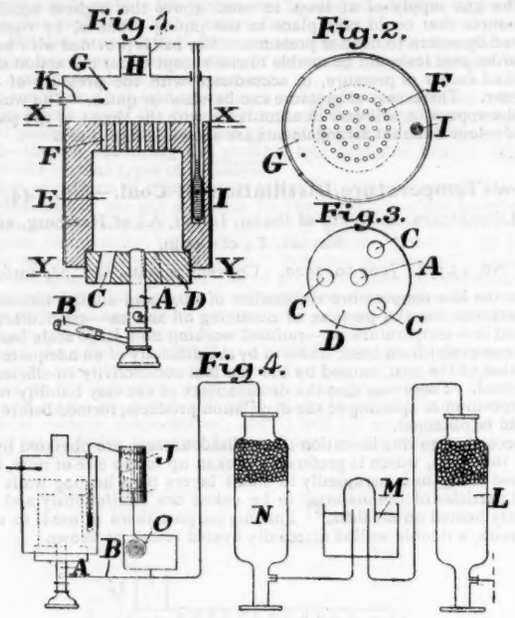
SOCIÉTÉ DES HAUTS-FOURNEAUX DE ROUEN, of Paris.

No. 16,503; June 18, 1920. Convention date, May 10, 1919.

The types of calorimeter which are employed at the present time for determining calorific values, the patentees remark, make use of the following principle, as a general rule. The heat of combustion is transmitted to a mass of water weighing "*M*" grammes, whose temperature is raised by "*X*" degrees. The heat absorbed is "*M X*" calories.

The present invention makes use of an entirely different principle. The fluid whose calorific value is to be determined is led at a constant rate into a suitable burner disposed within a body of any kind having sufficient conducting properties whereby its temperature is the same in all parts at any given moment. This body (which constitutes the

calorimeter) is disposed within an enclosed space, and out of contact of air currents or all sudden or considerable variations of temperature. The entire device is properly disposed in order to effect the complete combustion of the fluid. It is evident that in this case the temperature of the calorimeter varies in the same sense as the calorific value of the fluid under examination. It will, therefore, suffice to record or to observe the temperature of the calorimeter by means of a suitable device and to compare the results with a previously prepared chart established either directly or by comparison, in order to be able to ascertain at any time the calorific value of the fluid under test.



A French Calorimeter.

Fig. 1 is a sectional view, in elevation, of the calorimeter proper. Figs. 2 and 3 are sections taken respectively along the lines X—X and Y—Y. Fig. 4 shows the calorimeter and the accessory devices employed for measuring the calorific power of a gas.

The calorimeter is composed of a hollow cylinder of thick copper or other good heat-conducting metal, or by a double-walled jacket filled with liquid. At the lower part is disposed the burner A, supplied with the gas under examination through the pipe B. A sleeve is provided for regulating the inlet of the principal air supply to the burner. The secondary air supply enters through the orifices C, which also serve for inspection of the operation of the burner. The upper end of the burner is constructed together with a disc B, constituting the bottom of the chamber E, in which the combustion takes place. The products of combustion circulate within the chamber and then pass through a considerable number of narrow holes F, whence they reach the upper chamber G and escape into the outer air through the chimney H. The temperature of the calorimeter is measured by means of a thermometer I disposed within a recess in the copper mass. Temperature variations are recorded, for instance, upon a cylinder J moving in front of a tracer point. A thermometer K indicates the temperature of the gases when issuing from the combustion chamber.

The gas under examination only reaches the burner after having passed through a cleaning chamber L, a pressure regulator M, and a dryer N. Upon the pipe B is a gauge whereby the constant pressure of the gas can be observed through the medium of a pointer moving over the cylinder J which serves to record at the same time the variations in the calorific value of the gas.

In order to measure the calorific value of the gas correctly, the pressure should remain constant; and this requirement justifies the use of the recording pressure gauge O.

Tar Extractors and Scrubbers for Gas.—No. 153,109.

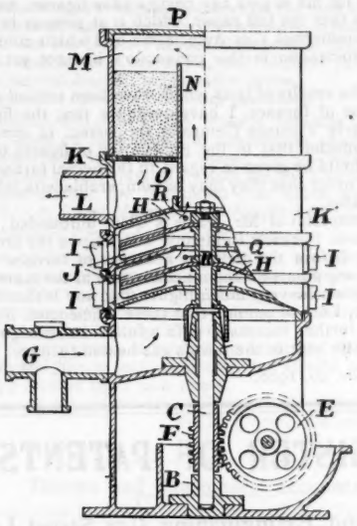
No. 19,478; Aug. 17, 1919.

WELLS, J. F., of Cairo, Egypt.

This invention relates to apparatus in which gas is caused to flow through a series of superposed chambers built-up in sectional units, and having a central inlet and outlet between which is interposed a disc or baffle furnished with vanes—the discs being mounted on a rotary shaft so that the former are rotated while the gas flows through the chambers successively. The uppermost gas-cleaning chamber is provided with an outlet pipe through which the gas flows upwardly, and returns by way of an annular scrubber into an outlet chamber formed above the uppermost gas-cleaning chamber.

In the vertical central section shown, the base is a cylindrical casting or structure carrying a foot-step bearing B, supporting a spindle C, with a further or upper bearing maintaining the spindle in a vertical and central position. The base is also provided with a sump or oil-bath providing lubrication for the skew-gearing F and E.

In the upper part of the base the inlet for the gas is at G; while the first of the tar-extraction chambers is at H, which is a casting fitting into the body of the apparatus, on the principle of a spigot-and-faucet joint—the joint being made in the ordinary manner with asbestos or cement. The chamber H is provided with outlets I for the discharge of water and tar extracted by the centrifugal force of



Wells's Tar Extractor and Gas Scrubber.

the paddles J, which are attached to a disc Q fixed to the spindle above the first of the chambers H.

Additional chambers, together with their paddles, may be fitted, so as to make the extraction take place in several stages as desired—each chamber built on the principle of a spigot-and-faucet or socket.

Above the upper chamber H is a chamber providing for the gas outlet L, the support of the gas-scrubber M, and a passage N for the exit of the gas from the upper tar-extraction chamber to the scrubber chamber. This latter chamber has a circular perforated plate O resting in the chamber K; and the scrubber chamber M is jointed to the chamber K with an ordinary spigot-and-faucet joint. The chamber M is filled with sawdust, or other convenient material, for the final purification of the gas after its passage through the extractor chambers H. These chambers and the discs Q are of conical of dished form, arranged with their convex surfaces uppermost, so that water supplied through pipes R to the centre of the upper surfaces or the discs will run down towards the periphery and fall on to the lower wall of the chamber, whence it drains into the outlets I.

The operation of the tar-extractor is as follows: The gas to be cleaned enters G, passing upwards into the chamber H, where it turns on meeting the rotary disc Q and is forced outwards by the rapidly revolving paddles J. The gas then passes upwards through the paddles on the upper side of the disc Q and into the next succeeding extractor chamber H. In the passage of the gas on the upper sides of the discs a jet of water is introduced through the pipes R. The water and tar are allowed to escape through the tar outlets I, through suitable seals to prevent egress of the gases. After passing through the last (upper) extractor chambers the gases pass by the pipe N, and thence downward through the sawdust scrubber to the outlet L, from which they are led away for use.

Gas Cooking-Stoves.—No. 154,030.

LARKIN, F. S., of Putney.

No. 23,781; Sept. 27, 1919. No. 24,296; Oct. 6, 1919.

This invention relating to gas cooking-stoves has more particular reference to fuel economizing devices of the kind in which a casing provided with utensil supporting members near its lower edge is secured around the utensil, leaving an annular space through which the products of combustion may ascend for the purpose of concentrating the heat upon the utensil.

The invention formed the subject of an article in last week's "JOURNAL," p. 636.

Gas Lighting Mantles.—No. 154,138.

STEVENS, R. H., of Ilford.

No. 14,980; June 2, 1920.

This invention is chiefly designed to increase the strength of incandescent mantles by coating them, more especially around the upper part, with a viscous fluid, or thin paste formed of kaolin, or like clay—such as pipeclay, as free as possible from iron—mixed with phosphoric acid and aluminum silicate. For example, 90 p.ct. of phosphoric acid, preferably what is known in commerce as pure phosphoric acid, and consisting of a syrupy liquid, may be added to 10 p.ct. of aluminum silicate (commercial aluminum silicate) and sufficient kaolin added to bring the mass to a convenient consistency for spreading over the surface of the mantle.

With inverted mantles, the part around and adjacent to the porcelain ring is coated; while in the case of upright mantles, the loop and shoulder or contracted part of the mantle are coated—preferably on both the inside and outside. The composition may be applied by revolving the mantle on a lathe and using a brush.

The mantles, after treatment with the composition, are thoroughly dried and then baked over a bunsen flame—*e.g.*, on burners such as those on which they are to be used—or in an oven at a suitable temperature. They are then preferably dipped in collodion or other compound and burned-off in the usual way.

In the case of mantles in the course of manufacture, the mixture

above mentioned may be advantageously applied to the fabric after the latter has been impregnated with a solution of thorium, cerium, or other salt having light-giving properties when burnt-off. The other stages in the manufacture of the mantle—shaping on formers, burning-off, and coating with collodion or the like—are effected as used.

PARLIAMENTARY INTELLIGENCE.

HOUSE OF COMMONS.

An Aldershot Electricity Supply Question.

Captain BOWYER asked the Secretary of State for War whether the military authority at Aldershot were negotiating to supply electricity in bulk, through the Aldershot Command electricity generating station, to the Aldershot Urban District Council within the statutory gas area of the Aldershot Gas, Water, and District Lighting Company; whether the Order under which the Aldershot Urban District Council now supplied electricity did not contain any clause authorizing the purchase of electricity in bulk; whether he had considered the legality of the proposal; whether the electricity generating station in question was intended to serve military purposes only; whether, if effect was given to the proposal, a non-trading Government Department, through its electricity generating station, which was not liable to pay local rates, would be seriously and unfairly competing with the statutory gas undertaking, which held contracts for the supply of gas and water to the War Department; and what steps he would take in order to remedy this matter?

Mr. CHURCHILL replied that negotiations were in progress in regard to this matter on the representation of the Ministry of Transport and the Aldershot Urban District Council. He was advised that though the Order which applied to the Aldershot Urban District Council might not contain a clause specifically authorizing the purchase of electricity in bulk, the Order was subject to the provisions of the Electric Lighting Act, 1882, under section 11 of which the District Council had full powers to contract for bulk supply. The Command generating station had hitherto been used to serve Government purposes only; but owing to a recent reduction of the Government demand, it had been suggested that, in the interests of economy, use might be made of the surplus capacity of the station in this way, instead of extending the plant at the District Council's generating station, which was undesirable. He understood that the area which it was proposed to supply was outside the area within which the Aldershot Gas, Water, and District Lighting Company had the right to supply, and that the District Council were the only body authorized to supply electricity in the area in question. He pointed out that the Government property paid the equivalent of local rates, although not legally liable to do so. The latter part of the question therefore did not arise.

Housing Schemes and Smoke Abatement.

Mr. H. MORRISON asked the Minister of Health what steps had been taken to ensure consideration being given by housing authorities to the recommendations contained in the interim report of the Departmental Committee on Smoke and Noxious Vapours Abatement.

Mr. PARKER, who replied, said the report had been brought to the notice of the Housing Commissioners, and they had been instructed to give careful consideration to proposals submitted with a view to giving effect to its recommendations. Copies of the report were about to be issued to local authorities, with a memorandum recommending consideration of the various substitutes suggested for the open coal-fire where these could be economically adopted.

Smoke and Noxious Vapours—Inquiry at Sheffield.

Lieut.-Colonel STEPHENSON asked the Minister of Health whether an inquiry was being held in Sheffield by the Departmental Committee on Smoke and Noxious Vapours Abatement, while no intimation of such inquiry had been sent to the Town Clerk, the Cutlers' Company, the Chamber of Commerce, or any public body in the city, nor any invitations to give evidence, and whether he was aware that, as conclusively shown at previous inquiries, a large proportion of the smoke made in Sheffield was due to the exigencies of its special manufactures, and that any restrictive legislation on this question was liable to endanger the high-grade steel industry of the city and to add to the existing lack of employment due to stagnation of trade.

Dr. ADDISON replied that he was making inquiry on the point raised in the first part of the question, and would communicate with Lieut.-Colonel Stephenson. The view expressed in the second part of the question would, no doubt, be considered by the Committee.

Public Utility Companies (Capital Issues) Act.

A copy was presented of a report on an application to the Board of Trade under the Public Utility Companies (Capital Issues) Act, by the Redhill Gas Company.

Private Bills for Next Session.

The number of Private Bills for the next parliamentary session which had been deposited by last Friday (the latest day on which petitions for Private Bills, in accordance with Standing Orders, could be deposited) was 76, as against something over 100 last session. With Provisional Order Bills, the number is increased to 116, which compares with 150 a year ago.

Another Glover-West Installation for Sydney.—A fourth installation on the Glover-West system of continuous carbonization is being installed at the Mortlake (Sydney) gas-works of the Australian Gas Light Company; the plant being designed to give an output of over 7 million c.ft. of gas per day without steaming. The existing three installations of Glover-West vertical retorts have a total capacity of more than 9 million c.ft. per day; so that when the new plant is completed, it will be one of the largest installations in the world of the continuous system of carbonization.

MISCELLANEOUS NEWS.

DINNER AND PRESENTATION TO MR. THOMAS HARDIE.

On Thursday last a complimentary dinner was given by the North of England Gas Managers' Association to Mr. Thomas Hardie, M.Inst.C.E., on the occasion of his leaving Newcastle-on-Tyne to take up his new post with the Gas Light and Coke Company. The ceremony took place at Tilley's Restaurant; and there was present a goodly number of members and visitors, under the chairmanship of Mr. A. W. Branson.

Mr. Herbert Lees, in giving the toast of "Our Guest," referred to his long personal association with Mr. Hardie, particularly in the work of the various bodies representing the gas industry in the North of England. The name of Hardie—and in this connection he mentioned Mr. Hardie's late father, and his brother William—had been bound-up in the history and development of the Association, and their guest had rendered exceedingly valuable services for many years. They congratulated him heartily on his important appointment; they sincerely wished him and his family every happiness in both the professional and the social life they were about to enter; and they trusted the friendships he had made among them would always be retained.

The toast was enthusiastically received, with musical honours.

Mr. A. W. Branson, as President, on behalf of the Association, then made the presentation of a very handsome grandmother clock and silver rosebowl (suitably inscribed). These were, he said, but tokens of the very high esteem and warm regard which every member felt for Mr. Hardie, and also of their best wishes for Mrs. Hardie. He trusted that the future would hold much that was good for them, but that they would often think of the happy days they had spent on Tyneside.

Mr. T. P. Ridley (Secretary and Commercial Manager of the Newcastle Gas Company) paid a high tribute to Mr. Hardie's work. He had been associated with Mr. Hardie in the Company for 24 years. A better colleague could not be hoped for—he had been a true friend. The Directors were also very sorry to lose him.

Mr. G. L. Swallow (Manager of Elswick Gas-Works, Newcastle) referred to the reconstructional and other work done by Mr. Hardie. The name of Hardie, he might remind them, had been associated with the Newcastle Company for 65 years. Their guest's dealings with the staff and workers had been most cordial; he had, by fairness and "sweet reasonableness," kept the spirit and tone of all departments at a high level.

Mr. W. Doig Gibb, whom Mr. Hardie succeeded as Chief Engineer at Newcastle, also spoke. He said he would be very glad to welcome him to the South; and he added his very best wishes for his happiness. From what he knew of Mr. Hardie's character, he was confident of the future.

Mr. Hardie, in reply, said it was impossible adequately to express his appreciation of their great kindness. They had honoured him from time to time by placing him in positions of responsibility in the Association; and they had generously looked at things which had been at all satisfactory and had very kindly overlooked mistakes. He had had around him engineers of great ability and commercial sagacity; and to their help and support he was really indebted for any success and progress he had been able to achieve. He was leaving a host of friends; but he hoped to keep the friendship green by meeting them from time to time both in London and Newcastle. Mr. Hardie also paid a tribute to the work of the staff who had served him under the Newcastle Company.

Mr. C. Dru Drury gave the toast of "Our Guest's Successor," Mr. Frank P. Tarratt. As regards the Association, he could say that no appointment could have given greater satisfaction. They fully appreciated Mr. Tarratt's worth, his ripe experience, and his proved ability. He assured Mr. Tarratt of the loyal support of the Association in every possible way.

Mr. Tarratt, in response, said that the names of his two predecessors—Mr. Gibb and Mr. Hardie—would for ever be associated with the Newcastle Gas Company. He would do his utmost to follow their traditions, and carry on their work; and he trusted to be able to call forth the same loyal support from the staff and help from his brother engineers in the district.

The toast of "The Chairman" was submitted by Mr. H. E. Bloor, of York; and the proceedings terminated with the singing of "Auld Lang Syne."

SULPHATE OF AMMONIA PRICE REDUCED FOR THE SEASON 1920-21.

The British Sulphate of Ammonia Federation, Ltd., are sending out a circular signed by the Chairman (Mr. D. Milne Watson), in which it is stated that, in view of the fall in the prices of agricultural produce and other commodities which is taking place throughout the world, they have decided to reduce the price of sulphate of ammonia from January onwards, though the cost of production has increased during the last six months.

The following are the new prices, which include the extra cost of delivery by rail due to the raising of railway rates:

January, 1921 . . .	£23 16 0	per ton delivered to consumer's nearest station or wharf in Great Britain, for prompt cash payment, in lots of 4 tons and upwards.
February, 1921 . . .	£24 3 6	
March/April/May, 1921	£24 11 0	

Existing terms and conditions will continue to apply, except that the commission allowed to fertilizer mixers, agricultural merchants, and co-operative societies will be increased to 3 p.ct. on the price to farmers for each month. The above prices and commission will apply

to all orders already placed with the Federation for January-May delivery.

Though the Federation's prices for June-December, 1920, were not subject to any fall clause, they recognize that many farmers and merchants took early delivery because summer and autumn prices were lower than the spring prices then announced. In order not to discourage buyers from taking early delivery in future seasons, they have decided to pay the following sums to farmers, fertilizer mixers, agricultural merchants, and co-operative societies on orders placed with the Federation or delivered with their consent:

On quantities delivered and paid for at					June/July	price,	*nil*	per ton.
"	"	"	"	"	August	"	9/0	"
"	"	"	"	"	September	"	22/6	"
"	"	"	"	"	October	"	32/6	"
"	"	"	"	"	November	"	42/6	"
"	"	"	"	"	December	"	52/6	"

Fresh orders for January-April delivery should be placed with the Federation immediately. In no circumstances will any further reduction in price be made by them for those months.

GAS REGULATION ACT APPLICATIONS.

The following further notices appear in the "London Gazette" of applications by gas undertakings to the Board of Trade under section 1 of the Gas Regulation Act for Orders providing for—(*a*) The repeal of any enactments or other provisions requiring the undertakers to supply gas of any particular illuminating [or calorific] value, and the substitution therefor of power to charge for thermal units supplied in the form of gas; and (*b*) the modification of the statutory or other provisions affecting the charges which may be made by the undertakers by substituting for the maximum [or standard] price per 1000 c.ft. now authorized, with an addition to meet increases in the costs and charges of, and incidental to, the production and supply of gas by the undertakers since June 30, 1914, a maximum [or standard] price per therm (100,000 B.Th.U.).

A copy of the applications made to the Board of Trade, and of all the documents submitted therewith, may be inspected, free of charge, at the gas offices concerned.

Any local authority or person desiring to make representations with regard to the application may do so by letter addressed to the Assistant Secretary, "Power, Transport, and Economic Department," Board of Trade, Great George Street, S.W., and posted not later than the date specified in the notice.

Aldershot Gas, Water, and District Lighting Company.

The standard prices now authorized, and the standard prices per therm which the undertakers have asked the Board of Trade to substitute therefor, are as follows:

(i) In the area of supply as it existed prior to the passing of the Aldershot Gas and Water Act, 1896, for the standard price of 3s. 8d. per 1000 c.ft., prescribed by section 30 of the Aldershot Gas and Water Order, 1890, a standard price of 1s. 7½d. per therm.

(ii) Within the extended limits of supply as defined by sections 4 and 6 of the Aldershot Gas and Water Act, 1901, a price exceeding such standard price by an amount never more than 1½d. per therm.

(iii) Within the extended limits of supply as defined by section 5 of the Aldershot Gas, Water, and District Lighting Act, 1909, a price exceeding such standard price by an amount never more than 2½d. per therm.

(iv) Within the extended limits of supply as defined by section 5 of and the first schedule to the Aldershot Gas, Water, and District Lighting Act, 1918, a price exceeding such standard price by an amount never more than 3¾d. per therm.

Brentford Gas Company.

The standard price now authorized in respect of the supply of gas by the undertakers is 3s. 9d. per 1000 c.ft.; and the price they have asked the Board of Trade to substitute is 1s. 7d. per therm.

Haslemere and District Gas Company.

The maximum price now authorized in respect of the supply of gas by the undertakers is 5s. per 1000 c.ft.; and the price they have asked the Board of Trade to substitute for this is 1s. 11d. per therm.

Hessle Gas Light and Coke Company.

The standard prices now authorized in respect of the supply of gas by the undertakers are 3s. 6d. and 4s. per 1000 c.ft.; and the prices which they have asked the Board of Trade to substitute for these are 1s. 8½d. and 1s. 10d. per therm.

Kingston-upon-Thames Gas Company.

The standard price now authorized in respect of the supply of gas by the undertakers is 3s. 6d. per 1000 c.ft.; and the price which they have asked the Board of Trade to substitute for this is 17·4d. per therm—the sliding-scale to operate below 16d. per therm.

Rochester, Chatham, and Gillingham Gas Company.

The standard price now authorized in respect of the supply of gas by the undertakers is 2s. 11d. per 1000 c.ft.; and the price they have asked the Board of Trade to substitute is 1s. 5d. per therm.

Ryde Gas Light Company.

The standard prices now authorized in respect of the supply of gas by the undertakers are 3s. 6d. and 4s. per 1000 c.ft.; and the price which they have asked the Board of Trade to substitute for these are 18½d. and 20d. per therm.

Slough Gas and Coke Company.

The standard prices now authorized in respect of the supply of gas by the undertakers are 4s. 8d. per 1000 c.ft. within the parishes of Datchet and Burnham and so much of the parish of Farnham Royal as lies to the north of the main line of the Great Western Railway and so much of the parish of Stoke Poges as lies to the north of the Slough Urban District; and 4s. 5d. per 1000 c.ft. in any other part of the Company's limits. The prices which they have asked the Board of Trade to substitute for these are 1s. 9d. per therm within the before-mentioned parishes of Datchet and Burnham and so much of the parishes of Farnham Royal and Stoke Poges as aforesaid, and 1s. 8d. per therm in any other part of the Company's limits.

Uxbridge, Wycombe, and District Gas Company.

The standard price now authorized in respect of the supply of gas by the undertakers is 4s. 3d. per 1000 c.ft.; and the price they have asked the Board of Trade to substitute is 19·4od. per therm.

The undertakers are authorized to charge for the supply of gas within the areas described in the first column hereunder the differential prices specified in the second column; and the amounts per therm which they have asked the Board of Trade to substitute for such differential prices are set out in the third column:

Area.	Present Differential Price.	Proposed Differential Price.
Urban district of Eton (except the portion within the limits of supply of the Slough Gas and Coke Company), and the parishes of Eton Wick and Boveney, and the portions of the parishes of Burnham and Dorney defined in section 4 of the Uxbridge Gas Act, 1916, until June 30, 1921	6d.	1·2d.
Thereafter	4d.	0·8od.
Borough and parish of High Wycombe (otherwise Chepping Wycombe), the parishes of Chepping Wycombe (rural), West Wycombe and Hughenden, and the portion of the parish of Wooburn defined in section 4 of the Uxbridge and Wycombe District Gas Act, 1920 .	6d.	1·2d.

Wandsworth, Wimbledon, and Epsom District Gas Company.

The standard prices now authorized in respect of the supply of gas by the undertakers and the prices which they have asked the Board of Trade to substitute for such prices are as follows:

Area.	Standard Price per 1000 C.Ft.	Proposed Price per Therm.
In the Wandsworth limits, as described in the first schedule of the Wandsworth, Wimbledon, and Epsom District Gas Act, 1912	4s. od.	16·68d.
In the Wimbledon limits, as described in the first schedule to the said Act of 1912 . . .	3s. 2d.	14·68d.
In the Epsom limits, as described in the first schedule to the said Act of 1912.	4s. od.	16·68d.

SPECIAL ORDERS UNDER SECTION 10.

Harpenden District Gas Company.

The Company have applied for a Special Order to extend their limits of supply to portions of the parishes of Redbourn and Harpenden Rural; to exclude this portion of the parish of Redbourn from the limits of supply of the Hemel Hempsted Gas Company; to sanction the purchase of land for gas-works purposes; to raise additional capital; to make new provisions with regard to dividends and the price of gas; to establish co-partnership; to authorize the purchase of gas in bulk; and for other purposes.

Swansea Gas Light Company.

The Company have applied for a Special Order to enable them to raise further capital on mortgage or by the issue of debenture stock.

Gas Prices in Ireland.—The Waterford Gas Company have notified an increase in the price of gas to 9s. per 1000 c.ft. An Enniskillen public meeting protested against the proposal of the Gas Company to raise the price from 8s. to over 12s. per 1000 c.ft., and asked the Urban Council to consider the advisability of introducing public electric lighting.

Slot-Meter Wheels.—The Drogheda Gas Committee reported to the Department that, owing to the difficulty of procuring suitable wheels for slot-meters to represent the current price of gas, considerable trouble was being experienced in collecting the difference between the cash in the meter and the actual amount of gas consumed. It was agreed that any consumer refusing to pay such difference in the account should have the supply cut off.

Cork Gas Supply.—As one result of the incendiary fires in Cork, the Gas Company issued notice that they were obliged to cut off the gas supply. This, of course, led to serious consequences; but it was unavoidable in the circumstances, and steps were at once taken to enable the supply to be resumed at the earliest possible moment. The consumption of gas must suffer from the devastation of such important business and other areas; and valuable plant and equipment have been lost.

Omagh Gas Finances.—The Omagh Urban Council adopted a report of the Finance Committee recommending that a statement be prepared showing the amount required for working capital in connection with the gas undertaking. The Committee's estimate was at £3000; and they urged that application should be made for the sanction of the Local Government Board to the raising of such loan as might be necessary: the intention being to avoid an overdraft. It was further recommended that application be made for power to charge for gas up to 10s. per 1000 c.ft.

CONTINENTAL UNION GAS COMPANY, LTD.

The Outlook Clearing—The Union des Gaz Relieved of the Responsibilities of the Milan Station.

The Ordinary General Meeting of the Company was held on Tuesday last week, at Winchester House, Old Broad Street, E.C.—Col. H. LE ROY LEWIS, C.B., C.M.G., D.S.O., in the chair.

The SECRETARY (Mr. Edwin C. Bode) read the notice convening the meeting; and the Directors' report and statement of accounts were taken as read.

ILLNESS OF THE DEPUTY-CHAIRMAN.

The CHAIRMAN: Gentlemen, before proceeding to the business of the meeting. I should like to say that our old friend, Sir Arthur Lucas, is unfortunately in bed through illness, and is unable therefore to be present at this meeting. He asked me to express his regrets to you; and I am sure we shall join most heartily in wishing him a speedy restoration to health again.

SIGNS OF THE CLOUDS BREAKING.

I have now to move formally that the report and accounts be received and adopted; and, in doing so, I should like to make a few remarks on the business of the Company during the year ended June 30. You will no doubt remember, gentlemen, that when I had the honour of addressing you last year, my speech could not have been styled an optimistic one. Indeed, I am afraid I painted matters rather black; and I think, if we look over the activities of last year, you will see my prognostication was not altogether unjustified. The year we have passed through has been one of extreme anxiety for this Company; but there are, I think, certain signs in the heavens that the clouds are breaking, though we have had perhaps one of the worst years the Company has had to face in the whole of its history. The activities, of course, of the Continental Union Company itself are really, I may say, of a somewhat secondary nature, because the whole gist and well-being of our Company depend entirely, as I explained last year, on the Union des Gaz. In that Company eight-tenths of our capital is invested; and if that Company is prosperous, we are prosperous. On the other hand, if that Company has a bad time, that bad time is unfavourably reflected in the balance-sheet and profit and loss account of this Company.

AFFAIRS OF THE CONTINENTAL UNION.

I shall not detain you long with the affairs of the Continental Union Company; but I should like to go in detail into the activities of the Union des Gaz for last year. There are only one or two remarks I wish to make about the finances of the Continental Union before we pass to the rather more serious and grave subject. In the profit and loss account there are some small variations of the figures. There is a slight increase in the management and general charges, amounting to about £200. That has been brought about almost entirely by the increases in rent. We have to pay more for our offices, which, I am afraid, is a burden that is probably borne in common with a great many City Companies. The second item in the profit and loss account —pensions in London and Messina—I hope next year may partly disappear, for we have a plan now by which we hope to redeem the pensions contracted at Messina. Therefore, that item will to a certain extent disappear. The third item in this account to which I want to draw your attention is the transfer to the contingency fund of £12,500. This, I think, requires some words of explanation from me. Indeed, my speech will be directed towards justifying the transfer; and I venture to think, when you have heard what I have to say, you will agree with me that prudence is our best policy at the present moment, and that we had better not distribute in dividend the small amount we have earned this year. The total amount we have to dispose of, standing to the credit of the profit and loss account, is £13,700; and this sum is the accumulation of the last four years. Therefore, what we earned last year is really not much more than £4000. But so long as the future is not clear to us—so long as there is (as I shall show you) a very large depreciation of our capital account—the policy of this Board is not to distribute in dividends any money which might be used in safeguarding our position.

THE STATIONS OF THE UNION DES GAZ.

So far as to the policy of the Continental Union. I shall now say a few words in explanation of the position of the Union des Gaz in the past year. The business of the Union des Gaz is divided into three main parts. There are three classes of stations which they operate. The first one is the Strasburg undertaking. The second is the French stations; and the third is the Italian group of stations. As for the Strasburg undertaking, in which we are partners with the town, I may say it is going on extremely well. We have very good reports from there. Profit is being earned on the undertaking; and, in fact, it gives us no cause for anxiety. The French stations are also doing extremely well—"extremely well" is perhaps an exaggeration; but they are doing quite well. The French are a hard-headed business nation. They realized soon after the armistice that the public utility companies could not possibly continue their operations if they were to be faced with heavy losses as the result of their activity. They therefore, by their legislation and legislative enactments, have decreed that public utility companies like gas undertakings are entitled to a fair return on their capital; and therefore gas prices in France have been adjusted, so that we do get now a fair return on our capital. Not only that, but we are being indemnified for some of the loss made on the stations during the war. Therefore that large and important group of French stations is certainly not doing badly at present. The most anxious part of our undertaking, to which I now pass, is the Italian stations. They are three in number—Alessandria (which is a very small thing, and is working at a fair profit), Genoa, and Milan. Genoa is a very black point on our horizon, and we are at the present moment engaged in arduous and difficult negotiations with the town and the Prefect of the province, to see whether we cannot get some sort of redress for our disastrous undertaking there. When I tell you that for some time last year we were working the Genoa undertaking at a loss of about 2 million lire a month, you may imagine how difficult the situation was. At the present moment, we have just managed to secure a decree from the Central Commission in Rome, which apparently gives us some reason to hope that this undertaking may not in future be worked at a disastrous loss. But what with the agitation among our *personnel*, which is very great and increasing, the high price of coal which we have suffered in the past, the extravagant freights, and the disastrous loss on exchange, you may imagine we view the future of the Genoa undertaking with a certain amount of concern.

RELIEF FROM RESPONSIBILITY AT MILAN.

So far as Milan goes, it is a much larger undertaking than Genoa, being almost three times the size in respect of gas consumption. But, I am happy to say, arrangements have been made whereby we have been relieved from the responsibility of the Milan undertaking, and not altogether to our disadvantage. We are therefore free now from the terrible nightmare of supplying vast quantities of coal to Milan, and of hiring boats to send the coal to Genoa. That this has been a most serious pre-occupation to us during the past year, you can imagine by the fact of the enormous quantity of cash required to handle business of this description. Before we concluded these arrangements, we had to send to Italy, roughly speaking, some 300,000 tons of coal every year. Before the war, it was quite easy to finance requirements of this description for about £300,000. But during last year the price of coal c.i.f. Genoa was about £8 per ton, so instead of the £300,000 we should have required to handle that business before the war, we should have needed last year £2,400,000! To be relieved of a financial burden of that description, you can understand, is not a small thing in the history of the Company.

COAL, FREIGHTS, AND EXCHANGE.

The general position for foreign gas undertakings, I need hardly tell you, is a very difficult one. Coal prices all last year were extravagant; and the result of it has been that we have driven from these shores a very large amount of our coal trade. The Americans now are throwing coal at the heads of the French and the Italians; and I believe at the present moment France is almost overstocked with coal. Freights have also been a terrible burden to face; and these, as you know, have of course fallen with great rapidity lately, and we hope they may come again on to a more normal scale. Exchange has been a nightmare. That has unfortunately got worse in the last few months. If you will follow the course of the Paris exchange since 1918, you will see how fearful the fall has been. In November, 1918, the Paris exchange was 25·83. When I had the honour of addressing you last year it was 38·80; and now, as you know, it is 59. The Italian exchange has been even worse. In November, 1918, it was 30·30; in November, 1919, it was 52; and now it is close upon 100.

THE CAPITAL INVESTMENTS.

All these difficulties—coal, freights, and especially exchanges—naturally have a very great effect on the capital account of the Continental Union; and it is to this that I wish now to draw your attention. The capital account of the Continental Union Company is divided into three parts. We have first of all the miscellaneous group of securities. Secondly, we have a group of securities which may be termed gas undertakings, almost entirely in this country. The third part is the bulk of our capital, which is invested in the Union des Gaz. As to the first part—miscellaneous securities—the depreciation is not very great, and will be about met by the transfer which we propose to make to the contingency fund. Our British and foreign gas securities are also depreciated; but there is, I think, ground for hope, as far as the British are concerned. An Act of Parliament was passed in August of this year—the Gas Regulation Act —which will enable the gas undertakings of this country to work at a profit. When this Act is got into thorough operation, I think we may certainly look to a general trend upwards in price of the securities of British gas undertakings. We have a good lot of money in the Imperial Continental Gas Association. As you have seen lately in the papers, that great Association has begun to come into its own again. So we shall get a substantial payment from our holding in it. Therefore I do not think we need in the least have any fear or despondency with respect to either our miscellaneous investments, or the money that is invested in gas undertakings. The third part of our capital, which amounts to about £800,000 out of our million, is invested in the shares of the Union des Gaz, where, as you know, it has been for a very long time now. As to the future of the Union des Gaz, I look upon its trading prospects as not bad ones. I think that Company will pay its way. The Union des Gaz will be able to make up its accounts for the six years which extend over the war period, and probably the result at the end of it will not be such a bad one as has been imagined. But the black point is exchange; and it does not require a very wise pundit to see that, if you have your money invested in franc securities, and the exchange is 59, there is a depreciation of about 60 p.ct. Therefore, this depreciation is one which you must face; and you must consider very carefully how you will deal with it.

THE OUTLOOK IN FRANCE.

To my mind, the whole question is wrapped-up and involved in what the future of France is. Is there any hope that France will pull herself together, and get on her legs, and re-establish something like the old parity of exchange? This is the whole question; and in my opinion, gentlemen, there is hope that this state of things will occur. I should like to give you a few facts and figures which have been provided by the French Finance Minister, and which are of interest in the present state of affairs. In the first place you have to look at what the condition of France was at the time of the armistice. Territory one-half the size of England had been completely devastated. The actual battle ground was in size and importance equal to the whole of Lancashire and the West Riding of Yorkshire. This battle ground had been fought over for four years by ten million men. The territory which was invaded produced 68 p.ct. of the pig iron of France, 78 p.ct. of its steel, 71 p.ct. of its sugar beet, and provided five-eighths of the taxation of the whole country. So you see it was a fairly big and important bit of the country. Then 50 p.ct. of the coal production capacity of the country was wrecked; and 4 million acres of arable land were completely ruined. France mobilized

one-fifth of the whole of her population; and of that number, I regret to say, one-fifth were either killed or hopelessly maimed. I think, by this short statement, you will see what a desperate state France was brought into. What has been done since the armistice was declared, which is only very little over two years ago? Of her ruined factories (most of which were in the district I have been talking about), 77 p.ct. are now working. Some 2½ million acres of arable land out of the 4 millions are now under cultivation; and her railways are now completely restored, and in working order. The production of coal in 1913 was 40 million tons. In 1920, it will probably reach 24 millions. In the devastated area (which the Germans ruined completely), for the first eight months of this year 2 million tons of coal were produced. This rate of production is going on, and in an increasing measure. There is one point which has often struck me as a singular injustice to France which one often hears made especially among people who know very little about the subject. It is that the French have not increased their taxation since the war. That is not the case. The taxation amounted before the war to less than 5 milliard francs. In 1920 it amounted to 20 milliards; so she has quadrupled her taxation. You must remember that though our rate of taxation has increased more than that of France, yet we have not had vast areas of our country, and that the most fruitful and productive part, totally wrecked. So the problem is not quite the same. The new taxation imposed in France is sound; 37 p.ct. of it is derived from capital and income, 49 p.ct. of it is derived from luxury taxes, and 13 p.ct. from articles in general use. The exchange position, as you know, is regulated largely by the balance of trade and the state of the currency of a country. As for the internal currency, and that fearful mass of paper money which is common to all countries on the Continent of Europe, no more advances are being made to the French Government by the Bank of France. So that a stop has been put to that. As to the balance of trade, the figures are extremely interesting. The imports in 1920 amounted to 27 milliards of francs—an increase of 2½ milliards over 1919. The exports amounted to 16½ milliards in 1920—an increase of nearly 10 milliards over 1919. Those figures refer to the first eight months of 1920. In normal times before the war, the imports exceeded the exports by 25 p.ct. In 1918, the excess was no less than 372 p.ct.; in 1919, it had fallen to 242 p.ct. For the first six months of 1920, the excess of imports over exports was reduced to 50 p.ct.; and by the end of September, the excess was reduced to 15 p.ct. In the October returns, the imports were 2½ milliards; and the exports were 2·3 milliard francs. Therefore the excess of imports over exports was only 10 p.ct. for October. I think that if you reflect on these figures, you will see there is hope for France, and that she is pulling herself together again. The exchange position (I do not say to-morrow or the next month or two) will eventually improve; and as soon as the exchange position improves, we shall be relieved from any apprehension with reference to the depreciation on our French investments.

DO NOTHING IN HASTE.

But at the present moment, gentlemen, the policy of your Board is to advise you to do nothing in haste—not to think, for instance, of such a thing as a forced liquidation, which would be impossible at the moment, or of any heroic plan for a reduction of capital, which would be ill-advised at the moment while the state of Europe and everything around us is in a state of flux and change. On the contrary, we think you have certain ground for hope; and if you will only hold your souls in patience—I do not say you will see a profit made next year—possibly in the years to come, the clouds may have rolled by, and we shall find the Continental Union has been re-established on a sound and sure footing. [Applause.]

Sir GEORGE TOUCHE, Bart., seconded the motion.

COMMENTS FROM PROPRIETORS.

Mr. CAVE ORME said that about twenty years ago the Continental Union proprietors began to have a very different account of things from what they had had formerly; and this through causes which were, of course, not due to the Board of Directors. Those causes had remained ever since in one way or another to trouble and worry them, and to occasion unpleasant accounts to be given from the chair. This continued up to the time of the war, at which period there was a little hope—the Continental Union having got rid of Messina and Montargis. Then the Company had degenerated into the mere position of a trust company. Then they had to possess their souls in patience all through the war—not a ray of hope had been received by the Company. The last two years had even been worse, though they had hoped that, when the war was over, they would have seen some prospect of a return to something like a dividend position. He did not blame the Board for what had been, because he knew the terrible difficulties they had had to face. But the proprietors of the Company were beginning to feel rather depressed by the continued want of any kind of indication that their concern was sound from a business point of view—he meant from the point of view of dividends to the proprietors and the preservation of their capital. He was glad though to hear from the concluding words of the Chairman that this state of things was probably coming to an end. The Chairman seemed to think, and he (Mr. Cave Orme) was glad to believe it, that, if the proprietors possessed their souls in patience a little longer, they would then find the Union des Gaz coming into clearer waters; and then the Continental Union would be able to face the proprietors with some prospect of paying a dividend on its capital, which, after all, was only trust-money. He was glad to learn from the Chairman that the affairs of the Union des Gaz were getting into a better position, and that in course of time it would be again a dividend-paying concern. He wished to ask the Chairman one or two questions. He did not know whether he understood correctly that the Milan station had been abandoned, and that the Union des Gaz would cease to have that great station to control. This, however, appeared not to be the case at Genoa; but he hoped, when Milan came to be surrendered (and that on terms which were favourable) that Genoa and Alessandria, and the whole of their Italian interests, would have gone from them. This would in every way, he thought, enable the Board to feel that they had a less thorny path, because, however bad labour troubles were in France and Italy, they would be worse. He should like to have an answer to the question. Another point was that he understood the greatest difficulty of the Board had been the supply of raw material. Now it appeared from what the Chairman had said that America was throwing coal into France; and he (Mr. Cave Orme) did not know whether this also applied to Italy. If this was the case, it had considerably relieved the situation for the Directors. Subject to these remarks, he desired to compliment the Chairman on his speech, and to say that he was very pleased to think that at any rate the Chairman was in a very hopeful spirit.

Mr. E. WOOLLEY said the Chairman dropped a remark towards the close of his speech as to liquidation or a reduction of capital. Such an idea as that had not at any rate entered into his (Mr. Woolley's) head. Had such a suggestion been made to the Board? His opinion at the present time entirely coincided with that of the Chairman. It would be most unwise of the proprietors in any way to contemplate such a project at present. He also wished to say how pleased he was to hear the remarks of the Chairman as to their prospects. The statistics and figures the Chairman had laid before them were easily understood, and pointed to the recovery of France. The proprietors also appreciated what the Chairman said as to Milan; in matters of this kind, to speak in too plain terms was not always advisable. When, however, the matter got farther, he should like the Chairman to tell them something more regarding that subject, because, of course, it was one of very great interest to the proprietors and their pockets. At the same time, they would not like the Board to go farther with information than was wise in the circumstances. He had no doubt, if they possessed their souls in patience, on another occasion the Chairman would be able to tell them what had happened—and, they hoped, to their advantage.

Sir JAMES REMNANT said he thought he was voicing the views of the proprietors generally when he said that, without exception, everyone of them had the most absolute confidence in the Chairman and his colleagues. They felt that what the Board had done for them during the past year was extraordinarily fine work. In respect of coal alone, the Chairman had told them that it formerly cost £300,000 a year, and now it cost £2,400,000. How he had managed to meet this, heaven only knew. That he had done it was a matter of sincere congratulation; and he could assure the Chairman and the Board that the proprietors appreciated this very much. Regarding Milan, the Chairman had intimated that serious and complicated negotiations were proceeding; and he hoped he would not be drawn into saying anything that should not be made public. The proprietors were perfectly content to leave the matter in the hands of the Chairman and the Board, who, they knew, would do their best for them.

The CHAIRMAN: I have to thank the speakers very much for the kind tone of their remarks. I should like to say, in answer to Mr. Cave Orme's references to the Italian stations, that the policy of that Board is exactly what he has outlined. The Board wished, if possible, to get rid of the Italian interests, and to consolidate the whole position in France. This has been their object since the end of the war. Up to the present, the negotiations have not been unsatisfactory to that Company; but at the moment they are of such a delicate and difficult nature that I am sure the proprietors will not desire to press me on the subject, though I can say that what has been accomplished has been good work done. But what may be accomplished may be even better work. I hope it will be. With reference to the question of the reduction of the capital, this has never, so far as I know, been in anybody's contemplation. But I thought it fair to draw attention to the heavy and serious depreciation of the capital, which has resulted almost entirely through the fluctuations of the exchange between this country and France; so that we could not be accused of not having faced the problem.

The motion was carried unanimously.

RE-ELECTIONS AND VOTES OF THANKS.

Proposed by the CHAIRMAN and seconded by Sir HENRY BIRCHENOUGH, Bart, K.C.M.G., Sir Arthur Lucas and Mr. A. F. Phillips were re-elected to their seats at the Board.

Moved by Mr. R. STEVENS, and seconded by Sir JAMES REMNANT, the Auditors (Messrs. A. T. Eastman and C. P. Crookenden, F.C.A.) were re-appointed.

The CHAIRMAN proposed that a vote of thanks be accorded to the staff at home and abroad for their services during the past year. They were well served by their staff. That in London was getting smaller and smaller, and perhaps it would depart altogether in time. But he hoped that so long as he was Chairman of the Company, he should have the valuable assistance of Mr. Bode, who kept him in good order. The other members of the staff did their work cheerfully; and it was something to be able to do that in these cheerless days.

Mr. WOOLLEY seconded the motion, which was heartily carried.

The SECRETARY thanked the Chairman for his kind words and the proprietors for the manner in which they had received the motion. He was sure all the members of the staff would in the future as in the past use their best endeavours to carry out their duties.

Moved by Mr. CAVE ORME, and seconded by Sir JAMES REMNANT, the Chairman and Directors were also cordially thanked for all they had done and were doing for the Company.

The Chairman's acknowledgment concluded the proceedings.

A Big Gas Bill.—At the Tipton Police Court last week, an application was made by Mr. J. F. Eales on behalf of the South Staffordshire Mond Gas Company for a distress warrant against Messrs. A. Harper, Sons, and Bean, Ltd. Mr. F. E. Smith said he appeared for the Receiver who had been appointed by an order of the High Court, and who was in possession of the assets of the defendants, who did not appear. Mr. Eales stated that the amount due was £2669—for gas £2245, fittings £413, and interest £10. A Receiver being appointed did not affect the position of the plaintiffs; and if the Magistrate made the order, they would have to apply in the ordinary way to the High Court for leave to distrain. The Bench decided to make the order forthwith, with special costs of £10 10s., and the costs of the Court.

WESTMINSTER AND THE NEW GAS CHARGE.

At the last meeting of the Westminster City Council, the Law and Parliamentary Committee reported that they had had before them a notice by the Gas Light and Coke Company that they have applied to the Board of Trade for an Order under the provisions of section 1 of the Gas Regulation Act, 1920. The standard price now authorized in respect of the supply of gas by the Company was 3s. 2d. per 1000 c.ft.; and they had asked the Board of Trade to substitute for this 1s. 3·6d. per therm.

The Town Clerk stated that, on receipt of a report from the City Engineer, he addressed a communication to the Board of Trade submitting that the Company should be required to supply gas of not less quality than that which they were under an obligation to supply prior to the war. The pre-war value of gas supplied was 538 B.Th.U.; so that the proposed standard of 487 B.Th.U. which appeared to have been adopted by the Company would register a loss in heating and lighting value of 51 B.Th.U. The increase of 3·94d. per therm over and above the estimated present-time costs of 11·68d. per therm, including interest, needed better justification, judging by the figures shown in the Company's explanatory table.

The Council unanimously approved the action taken in the matter.

PUBLIC LIGHTING IN THE CITY OF LONDON.

Reduction of Illumination.

At a Meeting of the Court of Common Council of the Corporation of the City of London, on Thursday last, the Streets Committee reported upon an undischarged instruction "to consider and report as to the possibility of effecting, without detriment to the public safety, a considerable saving in coal and expenses by reducing the number of lights in the principal thoroughfares in the City." The report was agreed to, and the reference discharged accordingly.

The reference to the Committee dated back some considerable time, since when substantial reductions in the lighting have been carried out, without in any way affecting the comfort or safety of the public. As will be remembered by readers, the "JOURNAL" gave full particulars of the scheme of the present lighting at its inception. This scheme was on a very generous scale. Since then it has been found practicable to reduce the lighting hours from 4117 per annum to 3940 in the case of electricity, and to 4024 in respect of the gas lighting—at the same time extinguishing a considerable number of the arc lamps in the main thoroughfares at midnight, and also reducing the number of burners in the high-pressure gas-lamps in the main roads, where such lamps were not on the street refuges or in important positions. All of this was the outcome of experience gained during the war, when the streets were in semi-darkness.

KENSINGTON BOROUGH COUNCIL AND THE GAS REGULATION ACT.

The General Purposes Committee of the Kensington Borough Council state that they have considered the notice of the Gas Light and Coke Company of an application to the Board of Trade for an Order under section 1 of the Gas Regulation Act.

A report by the Borough Engineer upon the proposal points out that the standard price proposed by the Company is at the rate of 1s. 3·6d. per therm; the present standard price being 3s. 2d. per 1000 c.ft., which is equivalent to 7·6d. per therm, assuming a calorific value of 500 B.Th.U. The Act has evidently been passed in order to place the gas industry in a satisfactory financial position; and the Company, in making their application, are only fulfilling this intent. It would appear that the price of 1s. 3·6d. per therm arrived at is based on the original standard price of 3s. 2d. per 1000 c.ft., *plus* the extra estimated cost of production. The present price of gas—4s. 8d. per 1000 c.ft.—of a calorific value of 487 B.Th.U., works out at 11·2d. per therm approximately; but from a statement prepared by the Company, there is a loss on working at this figure. On the basis of 487 B.Th.U. per cubic foot of gas, it appears that if the price of 1s. 3·6d. per therm is allowed and charged by the Company, the price of gas will be at the rate of 6s. 4d. per 1000 c.ft.

The Committee understand that the proposal is under the consideration of the London County Council, who are taking steps to oppose the application of the Gas Light and Coke Company; their principal object being to get the standard price fixed as low as possible.

MR. T. CARMICHAEL ON THE GAS INDUSTRY.

Before the Portsmouth Rotary Club, on the 14th inst., an address on the gas industry was delivered by Mr. Thomas Carmichael, the Engineer to the Portsea Island Gas Light Company.

After a short historical review from the inception of the industry, in the course of which it was noted that the Portsea Island Gas Light Company was incorporated in 1821, Mr. Carmichael gave some interesting statistics relating to the gas undertakings of the present day, and passed on to describe the industry's war work. The quantities of raw materials extracted from town's gas and placed at the service of the Department of Explosives Supply were given as:

Pure benzole	21,800,000 gallons (equal to 1,200,000 tons of picric acid).
Pure toluol	8,000,000 gallons (equal to 326,000 tons of 80/20 amatol).
Pure solvent naphtha	4,000,000 gallons.

The average extraction through the whole country was about 1 gallon per ton of coal, reducing the calorific value of the gas by some 3 p.ct.

In discussing the conservation of coal—a subject of the highest national importance—it was mentioned that about 18,000,000 tons of coal are annually carbonized for the production of gas in the United Kingdom. Progress in manufacturing methods has been a valuable aid to coal conservation; and if the "makes" of 25 years ago had not been improved upon, a further 7 million tons of coal per annum would be required. Though the nation's supplies of coal are sufficient for very many years' requirements, yet they are not unlimited; while the home consumption alone is an enormous figure, and the importation of coal is unthinkable. It is therefore essential to do our utmost in the direction of saving coal; additional reasons, if any were required, being furnished by the hygienic aspect of the matter, as well as by other evils—such as damage to public buildings. To effect any material saving in these, we must turn to the enormous amount of coal—some 35,000,000 tons annually—used for domestic purposes. By proper utilization (such as by carbonization) an equal duty could be performed by one-half this quantity; and there is thus not only an enormous waste in the coal itself, but in addition the whole of the bye-products, of great national value, are being dissipated into the atmosphere instead of being rendered available for use. On the basis of the above domestic consumption, the bye-products lost annually are:

Ammonia (as sulphate of ammonia)	390,000 tons
Tar	35,000,000 gallons
Cyanogen (as prussian blue)	46,900 tons
Sulphur (more than sufficient to make the whole of the acid required for sulphate of ammonia)	214,000 tons

It is therefore obvious that the wasteful open coal-fire must go, without considering the attendant advantages of cleanliness, labour saving, &c., offered by gas. A further realization of these facts by the public would result in a great saving of coal and bye-products, as well as in improved hygienic conditions, due to the extension of the gas and electrical industries, for both of which there is ample room in the world. The tendency of the future should be towards the closer co-operation of these industries. The aim of the gas profession is to secure the largest and most economical yield of thermal units in the form of gas from the coal carbonized; and future legislation must be more elastic, so as to enable the gas engineer to attain this object.

The various processes of gas manufacture, and the composition and properties of gas, were then outlined, with the aid of drawings and charts. The discussion of calorific value, and of the Fuel Research Board's recommendations, naturally led to the Gas Regulation Act. While this Act meets the technical requirements of the industry, and at the same time protects the public by giving certain controlling powers to the Board of Trade, gas is to be sold to the public by the "therm," which is defined to mean 100,000 B.Th.U., at such rates as will recognize the great increase of expenses due to the war.

The gas industry has not been guilty of "profiteering." While the cost of gas in Portmouth has risen by 107 p.ct., the cost of producing it has increased to a much greater extent, as will be seen from the following figures:

Unskilled labour, per hour	Increase	243 p.ct.
Coal, per ton	,,	191 ,,
Gas oil, per gallon	,,	375 ,,
General stores, per ton	,,	309 ,,

The sliding-scale basis for dividends, which was satisfactory to all concerned before the war, is obviously unfair at the present time; and when the above figures are considered, it will be appreciated that there is every ground for relief from present statutory conditions.

TRADE NOTES.

[For "Journal" Advertisers.]

Consett Iron Company's Booklet.

A new booklet of the Consett Iron Company, Ltd., co. Durham, dealing with their manufactures, contains several new handy and useful tables. Though the book is of waistcoat pocket size, it contains quite a lot of practical information.

Wholesale Fittings Company's Specialities.

Particulars of the various gas-lighting specialities of the Wholesale Fittings Company, Ltd., of Nos. 23-27, Commercial Street, E., are to be found in their newly issued catalogue, for the season 1920-21. There are illustrated inverted and upright burners and lamps, and accessories, as well as a good selection of globes and shades.

Davis Geysers.

A new edition of the geyser catalogue of the Davis Gas-Stove Company, Ltd., of No. 60, Oxford Street, W., deals with the various types of their well-known "sealed" and "open" patterns of water-heaters. Among the sealed types dealt with are the "Perfecta" and the "Shamrock." The patented construction of the "Perfecta" renders it not only exceedingly efficient, but also results in the cost of maintenance being kept down to the minimum. The interior of the "Shamrock" (as well as the "Perfecta") is detachable for cleaning or other purposes. It is constructed on the "double-handed" principle; the aperture not in use being stopped by means of a plug. Of the "open" type, there is, among others, the "Thistle"—also a "double-handed" machine, eminently suitable for use in connection with housing schemes and in workmen's dwellings generally. There are, of course, many other designs illustrated. With the Davis interlocking taps, it is impossible to light the burner until the water has been turned on; while the Davis automatic valve shuts-down the gas to a safe bye-pass the instant there is any interruption of the water flow.

Theft from a Gas-Meter.—At the Wolverhampton Police Court on Tuesday of last week. Arthur Lucas was charged with breaking open a gas-meter and stealing the contents, 8s. 3d. A meter inspector said he found that the slot portion had been broken away, and that 18,000 c.ft. of gas had been registered. Defendant was sentenced to three months hard labour.

CURRENT SALES OF GAS PRODUCTS.

Tar Products in the Provinces.

Dec. 20.

The average values for gas-works' products during the week were: Gas-works coal tar, 120s. to 125s. Pitch (all pitch prices are purely nominal) East Coast, 175s. to 180s. per ton f.a.s.; West Coast—Manchester, 175s. to 180s.; Liverpool, 175s. to 180s.; Clyde, 180s. to 185s. Benzole 90 p.ct. North, 3s. 1d. to 3s. 2d.; crude 65 p.ct. at 120° C., 2s. 3d. to 2s. 5d. naked at makers' works; 50-90 p.ct. naked, North, 3s. 2d. to 3s. 3d. Toluol, naked, North, 3s. 1½d. to 3s. 2½d. nominal. Coal tar crude naphtha in bulk, North, 1s. 2d. to 1s. 3d. Solvent naphtha, naked, North, 3s. to 3s. 2d. Heavy naphtha, North, 3s. 1d. to 3s. 3d. Creosote, in bulk, North, liquid, 1s.0⅝d. to 1s. 1¾d.; salty, 1s. to 1s. 1d. Heavy oils, in bulk, North, 1s. 1d. to 1s. 2d. Carbolic acid, 60 p.ct., 2s. 7½d. to 2s. 9d. Naphthalene, £37 10s. to £40; salts, £10 to £10 10s., bags included. Anthracene, "A" quality, 1s. per minimum 40 p.ct.; "B" quality, nominal.

Manchester District Tar Prices.

The price realized per ton of tar sold, according to the sliding-scale, during the month of October, was £9 8s. 3·33d.

FROM A MARKET CORRESPONDENT.

Tar Products.

Business has fallen away considerably during the past week; consumers still holding off in anticipation of an all-round reduction in prices. It is very difficult to get reliable quotations for pitch, because the briquette manufacturers will not do anything until they have settled the question of their association for collective buying. It is generally assumed that the scheme will be carried through, and that the chief consumers on the Continent will also join. It is expected by this means to bring down the price of pitch. Probably pitch will fall in any case. At the present time it is quite a nominal market, with practically no business to test quotations. Business in solvent naphtha is at a standstill. Rubber manufacturing trades are holding-off the market because of slackness in their particular line. There is no rush to buy naphthalenes, which are slightly easier, with reports of a slump in America which are somewhat disconcerting. Cresylic acid is almost dead. There is very little change in carbolic acid; crystals being still a weak market. The only firm spot is creosote, although here no further advance has taken place—in fact, in many quarters quotations for this material are thought to be high enough. There is practically no change in the position of intermediates, and business is almost at a standstill. Aniline oil and salts are a trifle lower; but manufacturers of salicylic acid hold firmly to their prices.

The range of quotations is as follows:

Benzole: 90% London 4s. 1d., North 3s. 10d. to 3s. 11d.; 50-90% 3s. 6d. London, 3s. 3d. to 3s. 4d. North; crude 60-65%, 2s. 5d. to 2s. 7d.; pure, 4s. 3d. per gallon naked.

Crude Tar: London, 105s. to 115s.; Midlands, 107s. 6d. to 117s. 6d.; North, 105s. to 115s. per ton *ex* works. Refined tar, 95s. per barrel (free) on rail.

Pitch: London, 200s. to 205s. per ton f.o.b.; East Coast, 195s. to 200s. per ton f.o.b.; West Coast, 195s. to 200s. f.a.s., with Manchester 200s. per ton, and Glasgow 195s. per ton; South Wales, 210s. per ton.

Solvent Naphtha: London, 3s. 1d.; Provinces average 2s. 11d. per gallon.

Crude Naphtha: Naked, 1s. to 1s. 2d.; North, 1s. per gallon.

Heavy Naphtha: 3s. 2d. per gallon.

Naphthalene: Refined flake, £35 per ton nominal; inferior, £25; crude, £14 to £18 per ton, according to quality.

Toluol: Naked, 3s. 4d. per gallon nominal; North, 3s. 2d.; pure, 4s.

Creosote: London, 1s. 2½d. to 1s. 3½d.; North, 1s. 2½d.; heavy oil, 10½d. per gallon in bulk.

Anthracene: 40-45%, 1s. 3d. to 1s. 4d. per unit per cwt.

Grease Oils: 18° Tw. (naked), £6 5s. per ton f.o.r. makers' works.

Pyridine: 18s. to 22s. 6d. per gallon.

Aniline Oil: 1s. 7d. per lb., drums extra.

Aniline Salts: 1s. 9d. per lb.

Cresylic Acid: Crude, 3s. 9d.; 95%, 3s. 9d. to 4s. 3d.; 97-99% 4s. to 4s. 6d.; pure 5s. 3d. per gallon *ex* works London, f.o.b. other ports.

Carbolic Acid: Crude 60%, 2s. 3d. per gallon; crystals 40%, 8d. per lb. nominal.

Salicylic Acid: Technical, 2s. 3d.; B.P., 2s. 10d. per lb.

Xylol: Pure, 5s. 3d.; commercial, 4s. 6d. per gallon.

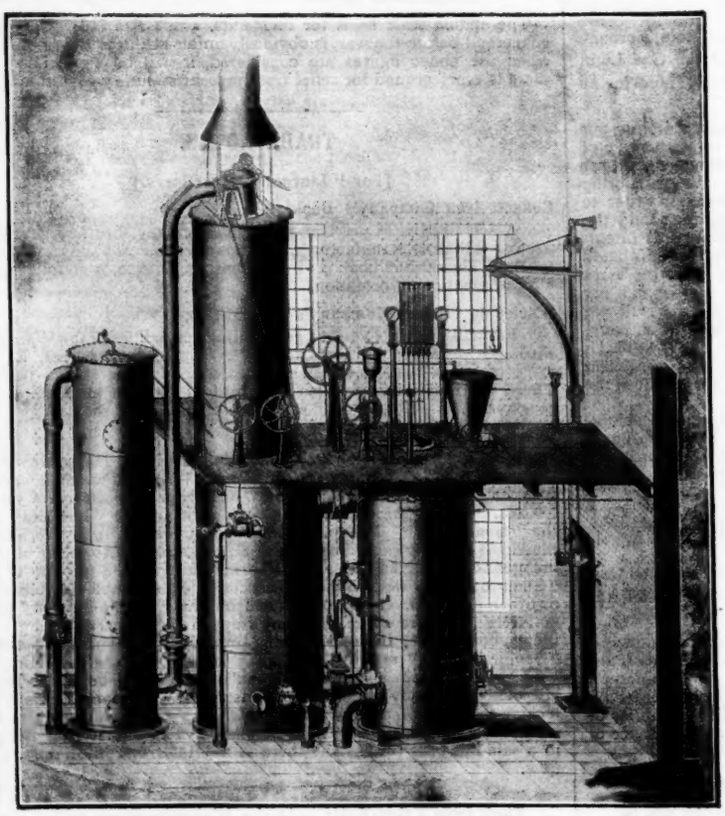
Resorcin: 12s. to 13s. per lb.

Alizarine 20%: 2s. per lb.

B. Naphthol: 3s. per lb.

Sulphate of Ammonia.

This is a pretty fair market at present in the midst of the more general dullness. Output seems fairly equal to requirements, despite recent interruptions to production. Exports for November amounted to a total of 13,186 tons. This is an improvement upon the 10,309 tons exported in October. It also compares favourably with the 10,058 tons exported in November last year, but is still a long way down from the 27,122 tons shipped in November, 1913. The eleven months' export of sulphate of ammonia this year is on the verge of 100,000 tons, compared with just under 80,000 tons in the corresponding period of last year and 295,930 tons in the first eleven months of 1913. Owing to a decline in the world price of nitrogen, prices of sulphate for home



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consumption are reduced forthwith as follows: January £23 16s., February £24 3s. 6d., and March-May 24s. 11s. per ton delivered—manufacturers to repay any sum in excess of £23 16s. which has been paid for deliveries during the period August-December, 1920.

American advices show that the market for sulphate of ammonia there had developed a rather erratic position with large stocks of material reported as having accumulated. Some of the so-called, high-priced houses are making an effort to hold quotations at the levels of several weeks ago; but not much encouragement is offered in this direction. Several dealers have named prices for double bags on spot that are the lowest record for the year, but even then have been unsuccessful in moving any material of consequence. There are reported to be in the retail market large quantities of sulphate of ammonia purchased on contract for shipment to Japan. These orders were cancelled. This, of course, has helped to bring about a heavy effect in the market.

Wilsons and Mathiesons Join Radiation, Ltd.

Messrs. Wilsons and Mathiesons, Ltd., of Carlton Works, Leeds (whose business dates back to 1854), announce that, after very careful consideration of all the factors involved, including the interests of their customers, they have decided to join Radiation, Ltd. The personnel of the firm will remain as hitherto; and it is not expected that the personal relationships with customers will in any way be interfered with. Among the considerations which have led to this decision are the need for solidarity, and the desirability of securing economy in organization and standardization. It is pointed out that rivalry which is truly productive will still be retained, inasmuch as each branch of Radiation, Ltd., will naturally do its utmost to attain superiority in progress, and economy of production. From inquiries Messrs. Wilsons and Mathiesons have made, they are satisfied that Radiation, Ltd., as heretofore constituted, have already effected a genuine and large improvement by the elimination of needless waste; and they believe that the linking-up of their firm will contribute further to this improvement.

Nottingham Gas Clerks' Salaries.—Since the clerks in the service of the Nottingham Corporation Gas Department became associated as active trade union factors with the National Organization of General Workers, there has been an insistent demand in support of further increased rates of remuneration. Those who are connected with the clerical branches of the undertaking whose cases had not been covered by a Special Committee appointed recently to deal with salaries, or through negotiations lately carried on, have made an application to the Gas Committee for an increase of wages; but the Committee have come to the conclusion that the time has arrived when a halt must be called in regard to these matters, and the application has been declined. Corporation expenditure has been increasing at a prodigious rate in Nottingham of late, much having gone in emoluments.

Gas Light and Coke Company's Co-Partnership Report.

The co-partnership report of the Gas Light and Coke Company for the year ended June 30 last states that the accounts again show a gratifying increase in the amount of savings placed on the withdrawable side. The Directors have decided that the rate of interest be maintained at 5 p.ct. for the current year. The total amount paid by co-partners into their trust accounts for investment in stock is not quite so large as last year; but the sum transferred by them from withdrawable to trust for the same purpose shows a distinct increase over last year's figure. The number of co-partners has increased to 9720, as against 8680 last year. The dividend declared on the ordinary stock for the year ended June 30 having been at the rate of 3 p.ct., the co-partnership bonus has been calculated at this rate. The co-partners' interest in the Company is now £298,746; £234,910 of stock (costing £193,840) being held by the co-partners, while the total of the trust and withdrawable balances as shown in the balance-sheet is £104,906.

Swadlincote Gas Manager Resigns.—At a recent meeting of the Swadlincote Urban District Council, following a breakdown at the gas-works, the Manager (Mr. F. Robinson) tendered his resignation. Mr. E. W. Goodhead (the Chairman of the Lighting Committee) said the Manager had met with difficulties all round. Had it not been for the new plant Mr. Robinson recommended them to lay down, the district would have been in darkness time after time. The Council agreed to accept the resignation, and to ask Mr. J. Ferguson Bell to make an investigation. The Council Chamber was illuminated by oil-lamps instead of gas.

Tyldesley Stokers' Unrest.—Tyldesley is disturbed by the attitude adopted by the stokers at the gas-works. They had been working on Sundays for time-and-a-half rates; but they now demand double pay. This was refused; and consequently last Sunday week the stokers declined to work, with the result that the town was badly illuminated. The Secretary of the Municipal Gas-Workers' Federation pointed out that the Council were completely fulfilling their obligation under the Regional Council agreement. The men's action was repudiated by their Union. It was illegal; and they were liable to prosecution. He requested the Council not to give way; for if the men succeeded, the authority of the Union officials would be undermined.

Acquiring Gas Undertakings by the Regulation Act.—The means which the Spenborough District Council propose using for the acquisition of the Heckmondwike, Liversedge, and Gomersal Gas Company's undertaking are interesting. The Gas Regulation Act gives statutory powers to the Board of Trade to make rules and regulations by which local authorities may acquire gas-works under an Order of the Board. The procedure by this method is considerably altered, and the costly and prolonged course of promoting a Bill in Parliament, and carrying it through Committees of both Houses is obviated. The Spenborough Council, on their solicitors' advice, have decided to adopt the new procedure; and they will be among the first local authorities to do so.

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An American Motor Fuel Case.

In a message to the "Gas Age," their New York correspondent gives particulars of the arrest of a man named John Chasler, of Brooklyn, on a charge in connection with a motor fuel which he is alleged to have "discovered" while mixing cornstalks, sugar, and yeast, and which is now declared to be useless. The case against him, according to this correspondent, is that of misappropriating a cheque for $5000 handed to him for 500 shares in the Fermogas Company—an organization stated by the District Attorney's office to have been formed to manufacture the cornstalk, sugar, and yeast fuel. There were some 200 stockholders in the Company; and finally most of them asked for an investigation by the District Attorney's office. This request was complied with; and it was found "that the product was tested and approved recently at Ramsay (N.J.) by Major D. M. Crawford and Colonel Samuel Jones, experts of the Military Academy at West Point. The officers put an 'O.K.' on the test records, but later, it is said, discovered that the cornstalk-sugar-yeast concoction never would have moved anything, had it not been for two barrels of grain alcohol concealed behind a wall, and connected with the tank by a hidden pipe."

An Inquiry at Kilkenny.

Mr. A. D. Price, Inspector under the Local Government Board for Ireland, held an inquiry on behalf of the Board of Trade into the application of the Kilkenny Gas Lessees, Ltd., to be allowed further to increase the price of gas in the city to 9s. 7d. per 1000 c.ft. For the Lessees, Mr. Wilson, K.C., asked that evidence as to the quality of the gas supplied should be ruled-out as irrelevant to the object of the inquiry. Mr. M. Buggy, for the Corporation, opposing the application, said that one of the items of the lease was that the Gas Company were to supply gas of a certain quality—14 c.p.; and, if they were not doing so, they were not entitled to have the price increased. The Inspector said he felt he should admit evidence respecting the quality of the gas. In arriving at a decision after a former inquiry in Kilkenny, evidence showing that the Gas Company were to blame for some of the loss weighed largely with him. Mr. G. W. Anderson (one of the Directors of the Lessees), examined in support of the application, stated that the 9s. 7d. per 1000 c.ft. would be for gas as at present supplied; but if they were compelled to furnish gas according to the lease, they would require an extra 6d. per 1000 c.ft. The actual cost of producing gas at the present time, including rent of the gas-works, worked out at 8s. 6d. per 1000 c.ft.; and if the price were to be lower than this, they would be simply making a present of the gas to the consumers. He submitted the cost of labour and materials, and said the charge for coal delivered at the gas-works worked out at £4 4s. 3d. per ton. The gas at present supplied was about 12 c.p. On behalf of the consumers, evidence was tendered by Alderman P. de Lougbry, Mayor of Kilkenny, and others.

APPLICATIONS FOR PATENTS.

[Extracted from the "Official List" for Dec. 15.]

Nos. 34,350 to 35,015.

BLACK, J. M.—"Actuating valves from a distance." No. 34,832.
BURDON, C. B.—"Valves, cocks, or taps." Nos. 34,398, 34,661.
CHANDLER, D.—"Apparatus for controlling flow of gas to testing instrument, &c." No. 34,917.
COOPER, H. G.—"Control valve for gas-burners." No. 34,478.
DOLPHIN, J.—"Atmospheric gas-burners for fires." No. 34,350.
DUCKHAM, Sir A. M.—"Heating liquids by introduction into molten metal." No. 34,732.
EDGAR, D.—"Gas-burners." No. 34,622.
FLEISCHER, E.—"Manufacture of coal distillation products." No. 34,590.
FOSTER, J.—"Method of preparing lime from limestone, and manufacture of power gas and ammonia." No. 34,545.
GILBERT, A. T.—"Gas-operated appliances for advertising, &c." No. 34,770.
HART, J. T.—"Gas-meter diaphragms." No. 34,535.
HELPS, G.—"Gas manufacture." Nos. 34,874, 34,875.
HILEY, G. J. O.—"Incandescent burners." No. 34,494.
HOWLETT & Co., M.—See Dolphin. No. 34,350.
HUGHES, G.—"Gas generators or producers." No. 35,012.
HURST, H.—"Inverted incandescent gas lighting." No. 34,352.
IVES, J.—See Hurst. No. 34,352.
KAGAN, A.—"Separating and purifying anthracene and carbazole." No. 34,733.
KNIBBS, N. V. S.—"Distillation of solid hydrocarbon containing materials." No. 34,555.
KOPPERS, H.—"Ovens for producing gas and coke." No. 34,429.
MOHN, T.—"High-tension ignition for multi-cylinder gas-engines." No. 34,698.
MORGAN.—See Duckham. No. 34,732.
MUNDAY, R. L.—"Taps for regulating flow of fluids." No. 34,645.
MUNRO, Ltd., R. W.—"Control-valve for gas-burners." No. 34,478.
NATIONAL GAS-ENGINE COMPANY.—See Mohn. No. 34,698.
OLDFIELD, J. W.—"Portable stands or supports for economizing heat from gas-burners." No. 34,852.
ROBERTS, W. E.—"Incandescent burners." No. 34,494.
SLACK, J. E.—"Pipe-joints." No. 34,723.
SOUTHALL, J.—"Street lighting." No. 34,629.
SOUTH METROPOLITAN GAS COMPANY.—See Chandler. No. 34,917.
THERMAL INDUSTRIAL AND CHEMICAL (T.I.C.) RESEARCH COMPANY.—See Duckham. No. 34,732.
TONKS, G. H.—"Fastening-device for supporting gas-fittings. No. 34,847.
WILSON, W. G.—See Burdon. Nos. 34,398, 34,661.
YOUATT, G.—"Shades for gas lights." No. 34,816.

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Housing Schemes and Gas-Fires.—The Glasgow Corporation Housing Committee have had submitted to them a report by the Director of Housing relative to the saving which would accrue in the erection of houses by so building flues for bedrooms that coal-fires would be eliminated and the rooms heated by gas-fires. From this it appears that a sum of £3 17s. 8d. would be saved per house of the four-apartment type. The Committee recommended that the present plans, providing chimneys suitable for coal-fires, be adhered to.

Inferior Coal for Gas Making.—The Leyton Urban District Council Lighting Committee report that they have had before them a letter from the Lea Bridge District Gas Company, intimating that the quality of the gas reported by the Gas Examiner as being below standard was undoubtedly due to inferior coal supplied to the Company. In the circumstances, the Committee recommend that the explanation of the Company be accepted, but that they be requested to inform the Council as to whether the price paid for the coal complained of was the same as for coal used which gave no cause for complaint.

The Shortage of Meters.—It has been reported to the Ossett Corporation Gas Committee that considerable difficulty is being experienced in obtaining new gas-meters; and in view of the fact that a large number of meters will shortly be required for new houses, the Chairman suggested that in cases where there are at present two meters in one house—one for lighting and one for cooking purposes—one meter should be taken out, subject to satisfactory arrangements being made with the tenant. This suggestion was approved by the Committee.

A Gas Undertaking's Bargain.—"A splendid opportunity," was Mr. Venables' observation at a meeting of the Walsall Town Council last week when submitting the following recommendation: "That an agreement be entered into with the Brownhills Chemical Works Company for the disposal of surplus tar made at the Corporation gas-works, for a period of five years from Jan. 1, 1921." Under the agreement, he mentioned that the undertaking would receive more money than they ever expected from this source. Arrangements had been made for retaining the tar required for local purposes.

STOCK MARKET REPORT.

THE Stock Exchange has had another very trying week—all the old sinister and depressing factors being in full action, and thus wrecking the fond hopes entertained that they were abating, if not passing away altogether. Moreover, they were last week supplemented by a development of weakness in Wall Street. No sign of amelioration showed itself as the week went on; and the general tone at the close was very unpromising.

The gilt-edged market had its share of troubles. In Home Government issues, with the exception of Consols, which held their own, the rest of the big four had a considerable drop—War Loan touching 82½, a record figure. Friday's prices were as follows: Consols 43⅞-44¼, War Loan 82⅛-82½, Funding 65¼-65⅝, Victory 71⅛-72⅜. Bonds were weaker, and Corporation issues receded. Home Rails made an effort to recover, but fell again. Canadians were irregular, and Argentines lower.

The Foreign Market was depressed for some time, but eventually made a partial rally, aided by better exchanges. In this respect French, Greek, and Belgian came off best; but Russian, Chinese, and Japanese gave way

The Miscellaneous Market was, as heretofore, an especial prey to the persistent slump in prices; and it would be difficult to find any line, with perhaps the exception of one or two mines specially circumstanced, that escaped. Rubber and Oil and Industrial undertakings of all sorts were hard-hit.

Business in the Gas Market had a great falling-off in point of activity—in fact, it was a week more barren of business than any for a very long time past. Only nine companies were dealt in at all, and some of these scored but one bargain. The general tendency, however, was steady. The London companies were firm—Gas Light and Coke advancing 1, and South Metropolitan and Commercial being unchanged. Most of the changes in quotation were *ex div.* adjustments of debenture stocks. Imperial Continental was the most active, but weakened a little; the quotation falling 3. A little more notice was taken of Primitivas; but they did not change.

Bargains done for cash during the week were as follows: On Monday, Commercial 4 p.ct. 54, ditto 3½ p.ct. 48, ditto debenture 43, Gas Light ordinary 53, 53⅛, 53⅛, 53⅜, ditto maximum 38¼, Imperial Continental 144, 145, 145¼, 145⅛, 146, 146⅛, Primitiva preference 21s. 6d., South Metropolitan 59⅛, 60, 61, Croydon 5 p.ct. maximum "D" 54. On Tuesday, Commercial 4 p.ct. 54½, ditto 3½ p.ct. 48½, Gas Light ordinary 53, 53⅜, 53⅞, ditto maximum 37⅜, Imperial Continental 144, 144½, 145, 145¼, 145⅛, 145⅜, Primitiva debenture 67⅜, 68⅛, South Metropolitan 60, 60⅛, 60½, 61. On Wednesday, Commercial 4 p.ct. 55, ditto 3½ p.ct. 48, ditto debenture 44, Gas Light ordinary 53⅜, Imperial Continental 143, 143⅜, 144, 144⅛, 145, Primitiva 9s. 6d., ditto preference 20s., 20s. 6d., South Metropolitan 60¼, 61. On Thursday, Bombay 4⅛, European 5⅛. 6, Imperial Continental 142½, 142½, 143, 143⅜, 144, Monte Video 71⅜, Primitiva 9s., ditto preference 19s. On Friday, Gas Light ordinary 53, 53⅛, 53⅛, ditto maximum 38¼, ditto preference 56, ditto debenture 45¼, ditto 10 p.ct. bonds 133, Imperial Continental 142½, 143, 143⅛, 143⅛, Primitiva 9s., ditto preference 19s., 20s., San Paulo preference 6½.

In the Money Market, the position opened quite easy and remained so throughout the week; supplies being ample to meet all requirements, now much reduced owing to the depressed condition of trade. Discount rates continued fairly steady, but, if anything, rather inclined to relax. Silver recovered somewhat in mid-week, but fell back again. The Bank rate is 7 p.ct., fixed on April 17 last.

ANTE-WAR PRICES AND DIVIDENDS, LATEST DIVIDENDS, AND LAST WEEK'S BARGAINS.

Issue.	Share.	When ex-Dividend.	Ante-War Dividend & Bonus.	Last Dividend.	NAME.	Closing Prices, July 30, 1914.	Present Prices.	Lowest and Highest Prices of Bargains.
£			p.c.					
182,049	Stk.	Aug. 27	4	4%	Aldershot 4 p.c. Pref.	...	56—61	...
1,551,868	,,	Oct. 14	2½	3⅛%	Alliance & Dublin Ord.	59—64	38—43	...
374,000	,,	July 14	4	4%	Do. 4 p.c. Deb.	76—79	47—52	...
280,000	5	Oct. 28	7½	8%	Bombay, Ltd.	5¼—5⅜	4¼—4½	4½
100,000	5	Aug. 12	16	5%	Bourne-mouth Gas and Water { 5 p.c.	...	8—9	...
383,110	10	,,	7	7%	Bourne-mouth Gas and Water { B 7 p.c.	15—15½	8½—9½	...
115,000	10	,,	6	6/-	Bourne-mouth Gas and Water { Pref. 6 p.c.	13½—14	7½—8½	...
162,065	—	June 25	—	4%	Bourne-mouth Gas and Water { 4 p.c. Deb.	...	62—64	...
992,045	Stk.	July 14	14	30/-	Brentford A Consolid.	261—266	50—55	...
734,920	,,	,,	11	26/3	Do. B New	204—209	47—52	...
55,000	,,	,,	5	5%	Do. 5 p.c. Pref.	109—111	68—73	...
221,400	,,	Dec. 15	4	4%	Do. 4 p.c. Deb.	91—93	58—60*	...
214,775	,,	Aug. 27	11	7½%	Brighton & Hove Orig.	208—213	110—120	...
244,200	,,	,,	8	5½%	Do. A Ord. Stk.	154—159	75—83	...
1,287,500	Stk.	July 29	5	5%	Bristol 5 p.c. max.	...	...	...
530,000	20	Sept. 15	12½	10%	British	44—45	20—22	...
120,000	Stk.	June 25	4	4%	Do. 4 p.c. Deb. Stk.	88—90	57—59	...
245,771	,,	,,	4	4%	Buenos Aires 4 p.c. Deb.	85—87	39—42	...
100,000	10	May 27	—	—	Cape Town & Dis., Ltd.	1½—2½	7—7½	...
100,000	10	Dec. 10	—	4½%	Do. 4½ p.c. Pref.	4—6	5—6*	...
100,000	Stk.	June 25	4½	4½%	Do. 4½ p.c. Deb. Stk.	70—75	56—61	...
157,150	,,	Feb. 26	5	5%	Chester 5 p.c. Ord.	108—110	...	...
1,513,280	,,	Aug. 12	5/9/4	30/-	Commercial 4 p.c. Stk.	106—108	54—59	54—55
560,000	,,	,,	5½	26/3	Do. 3½ p.c. do.	103—105	47—52	48—48½
475,000	,,	Dec. 15	3	3%	Do. 3 p.c. Deb. Stk.	69½—71½	42—45*	43—44
800,000	,,	Dec. 11	4	—	Continental Union Ltd.	76—79	25—30	...
200,000	,,	,,	7	—	Do. 7 p.c. Pref.	115—118	40—50	...
51,600	,,	Aug. 27	14½	10½%	Croydon A 10 p.c.	...	125—135	...
278,400	—	,,	11½	7½%	Croydon B and C 7 p.c.	..	90—100	...
492,270	Stk.	—	6	5%	Derby Con. Stk.	123—125	...	...
55,000	,,	—	4	4%	Do. Deb. Stk.	102—104	...	...
1,002,180	10	Jan. 29	10	5/0	European, Ltd.	17½—18	6—7	5⅞—6
16,298,975	Stk.	July 29	4/17/4	30/-	Gas Light and Coke { 4 p.c. Ord.	98—102	52—55	53—53½
2,600,000	,,	,,	3½	26/3	Gas Light and Coke { 3½ p.c. max.	76—79	36—39	37½—38½
4,062,235	,,	,,	4	4%	Gas Light and Coke { 4 p.c. Con. Pref.	96—99	55—58	56
4,674,850	,,	Dec. 15	3	3%	Gas Light and Coke { 3 p.c. Con. Deb.	72½—74½	44—47*	45½
130,000	,,	Dec. 11	10	10%	Gas Light and Coke { 10 p.c. Bonds.	...	...	133
82,500	,,	Sept. 15	5	3⅛%	Hastings & St. L. 5 p.c.	...	53—58	...
258,740	,,	,,	3½	2½%	Do. 3½ p.c.	87—89	37—39	...
70,000	10	May 13	11	8%	Hongkong & China, Ltd.	16½—16¾	8½—9½	...
86,600	Stk.	Sept. 15	9	5⅝%	Hornsey 7 p.c.	...	87—89	...
131,000	,,	Aug. 12	7½	4½%	Ilford A and C	151—154	79—84	...
65,780	,,	,,	6½	3½%	Do. B	115—118	57—62	...
65,500	,,	June 25	4	4%	Do. 4 p.c. Deb.	92—94	55—58	...
4,940,000	,,	May 14	9	4½%	Imperial Continental	150—160	142—147	142½—146½
1,235,000	,,	Aug. 12	3½	3½%	Do. 3½ p.c. Deb. Red.	84—86	92—97	...
235,242	,,	Sept. 15	6½	5%	Lea Bridge Ord. 5 p.c.	119—121	80—85	...
2,498,905	,,	Feb. 26	10	37/6	Liverpool 5 p.c. Ord. { A.	211—213	...	} ...
					Liverpool 5 p.c. Ord. { B.	146—148		
306,083	,,	June 26	4	4%	Do. 4 p.c. Pr. Deb. Stk.	...	...	...
165,736	,,	Aug. 12	7/5/6	3½%	Maidstone 5 p.c.	...	52—57	...
75,000	5	June 11	6	3%	Malta & Mediterranean	4¼—4½	1¾—2¼	...
250,000	100	Oct. 1	4½	4½%	Met. of Melbourne { 4½ p.c. Deb.	99—101	86—93	...
541,920	Stk.	Nov. 26	4	6%	Monte Video, Ltd.	11¼—12	68—73	71½
1,875,892	,,	July 29	4½	3½%	Newcastle & Gatsh'dCon.	98½—99½	60—61	...
529,705	,,	June 25	3½	3½%	Do. 3½ p.c. Deb.	82—83	50—51	...
15,000	10	Sept. 15	—	8%	North Middlesex 10 p.c.	...	12½—13½	...
55,940	10	,,	7/14/0	8⅝%	Oriental, Ltd. 7 p.c.	14—15	7—7½	...
300,000	Stk.	Nov. 26	8	8%	Ottoman, Ltd.	117—122	96—99	...
60,000	5	Mar. 26	10	1/-	Portsea Island, B	7¼—7⅞	2—3	...
60,000	50	Aug. 27	13	7½%	Do. C	128—131	65—70	...
100,000	50	,,	12	6½%	Primitiva Ord.	118—121	50—55	...
249,980	5	April 29	8	—	Do. 5 p.c. Pref.	5½—6	⅛—¼	9/—9/6
499,960	5	June 26	5	—	Do. 4 p.c. Deb.	4¼—5	¼—1⅛	19/—21/6
521,600	100	Dec. 1	4	4%	Do. ,, ,, 1911	91—93	67—69	67½—68½
600,000	Stk.	July 29	4	4%	River Plate 4 p.c. Deb.	...	40—42	...
346,198	,,	June 25	4	4%	San Paulo { 6 p.c. Pref.	85—87	37—42	...
150,000	10	Sept. 30	6	6/-	San Paulo { 5 p.c. Deb.	10¼—11	6¼—7½	6½
125,000	50	July 2	5	5%	Sheffield A	47—49	38—40	...
135,000	Stk.	Aug. 27	10	5%	Do. B	223—224	60—63	...
209,984	,,	,,	10	4%	Do. C	222—224	57—59	...
523,500	,,	,,	10	3½%	Shrewsbury 5 p.c.	220—222	54—57	...
133,201	Stk.	Sept. 15	4	4%	South African	...	...	...
90,000	10	Sept. 30	9	9%	South Met. Ord.	10¼—11¼	10¼—11¼	...
6,609,895	Stk.	Aug. 12	5/4/0	30/-	Do. Red. Pref.	111—113	58—61	59½—61
250,000	,,	July 14	—	5%	Do. 3 p.c. Deb.	...	91—93	...
1,895,445	,,	,,	3	3%	South Shields Con. Stk.	72½—74½	45—48	...
224,820	,,	Aug. 27	8½	3%	S'th Suburb'n Ord. 5 p.c.	157—159	95—96	...
1,087,795	,,	July 29	6	3½%	Do. 5 p.c. Deb. Stk.	114—116	56—61	...
247,558	,,	June 25	5	5%	Southampton Ord.	116—118	67—72	...
647,740	,,	Nov. 12	7½	3½%	Do. 4 p.c. Deb. Stk.	99—102	55—58	...
121,275	,,	June 25	4	4%	Tottenham and District { A 5 p.c.	...	59—61	...
120,000	,,	Aug. 12	—	3½%	Tottenham and District { B 3½ p.c.	135—138	60—65	...
782,275	,,	,,	6	2½%	Tottenham and District { 4 p.c. Deb.	115—117	50—55	...
181,255	,,	Dec. 15	4	4%	Tuscan, Ltd.	87—89	55—58*	...
182,380	10	Dec. 30	5	—	Do. 5 p.c. Deb. Red.	5—6	1—2	...
149,900	10	July 1	5	5%	Tynemouth 5 p.c. max.	93—95	45—50	...
236,476	Stk.	Sept. 15	5	3⅛%	Wandsworth, Wimbledon, and Epsom—	108½—109	69—71	...
30,000	,,	Aug. 27	8½	47/6	Wandsworth A 5 p.c.	151—156	75—80	...
255,636	,,	,,	6½	32/6	Do. B 3½ p.c.	129—134	53—58	...
108,075	,,	,,	—	33/3	Do. C	...	50—55	...
140,865	,,	,,	—	33/3	New Ordinary	...	50—55	...
352,000	,,	,,	6½	26/3	Wimbledon 5 p.c.	117—122	43—48	...
98,000	,,	,,	6½	32/6	Epsom 5 p.c.	121—126	50—55	...
88,416	,,	June 25	3	3%	3 p.c. Deb. Stk.	66—69	44—47	...

*Ex Div.

Bridge of Allan Gas-Works Inspection.—After an inspection of the Bridge of Allan Gas-Works by the Gas Committee, Mr. J. A. Tait (the Manager) and Mr. J. W. Napier (of Alloa), the Town Council have resolved to put into effect at the earliest possible date views expressed by Mr. Napier as to the best methods of bringing the gas undertaking back to the favourable financial position it occupied before the war.

Strike Averted at Bakewell.—A threatened strike of stokers at the Bakewell Gas-Works has been averted. As a result of the Council refusing to accede to a further increase of wages, the stokers handed in notices, which would have expired on Christmas Eve. The leaders of the men, however, had a conference with the Council, who offered an increase of 1s. per day or shift, with a proportionate advance for overtime. This offer was accepted by the men.

Earby and the Gas Regulation Act.—The Earby District Council have received notice from the Earby and Thornton Gas and Lighting Company, Limited, with reference to an application to be made by them under the Gas Regulation Act. The Council empowered their Clerk to write to the Company inquiring if they are prepared to undertake to charge only such a price to consumers for gas as will enable the payment of the same rates of dividends (10 p.ct. and 7 p.ct.) to shareholders as before the war.

Quality of Gas in Nottingham.—Not for many years have the complaints in Nottingham and the district been so general in regard to the poor quality of the gas which is being supplied as they have been during the last few days. Official explanations represent that statutory requirements are being entirely complied with, and that as to lighting deficiencies the fault may be traced to defective fittings rather than to any inefficiency upon the part of the carbonizing departments. But admittedly the calorific standard is open to improvement; and widespread grumbling upon this score is culminating in the determination to bring the whole subject to the consideration of the Council.

Care of Frozen Wet Meters.—During the recent cold weather, the Birmingham Gas Department received a number of complaints from consumers whose gas supply was interrupted through wet meters freezing. The department pointed out that the inconvenience thus caused might be avoided by the consumers themselves if they would adopt the precaution of wrapping-up the meter in sacking or blankets, so as to protect it from cold draughts of air. Many meters are fixed in vestibules and other exposed positions, where the keen wind quickly causes the water in the meter to freeze. In the event of this occurring, consumers were advised to heat a brick or some large stones, and place them in close proximity to the meter; the whole being wrapped-up with sacking or blankets. Care should be taken that the bricks are not heated to such an extent as to cause any risk of fire.

Coal Position of Gas Undertakings.—A statement by the Mines Department that coal supplies in the Midland area have not yet reached a position in which export is possible, has led to the publication of a number of interviews. In one of these, a representative of the colliery owners stated that a good deal of material over half-an-inch was accumulating at the collieries, owing to short time in the manufacturing industries; and this might well be shipped but for the embargo, without endangering home supplies. There was plenty of material in the larger class of fuel not wanted for manufacture, and which was entirely unsuited to gas production. A lot suitable for steam-raising has accumulated in colliery wagons; and in some cases, owing to the scarcity of wagons, it had to be put on the ground. It was true, he said, that some of the gas undertakings had only about a week's or a fortnight's supply in hand. The situation, however, would be rapidly relieved in certain districts if they could get supplies through on the railway. Delay in this respect had been very awkward for some of the small gas-works. The smaller works generally did not care to be put to the expense of putting coal down and picking it up again.

The workmen employed by the Newcastle-on-Tyne and Gateshead Gas Company have raised, by weekly contributions during the past year, a sum of £678 in aid of medical charities.

A lecture which was much enjoyed by the audience was delivered by Miss C. M. Botley, to the Natural History Society at Hastings; her subject being "Astronomical References in Literature."

The Directors of Gibbons (Dudley), Ltd., have declared the remaining 3½ p.ct. dividend on the 7 p.ct. preference shares; and a further interim dividend of 5 p.ct. on the ordinary shares—making 10 p.ct. for the year, free of income-tax.

The General Purposes Committee of the Bethnal Green Borough Council report that they have given careful consideration to the notices received from the Gas Light and Coke Company and the Commercial Gas Company of applications made to the Board of Trade for Orders under the Gas Regulation Act, and have, on behalf of the Council, made representations to the Board of Trade urging the Board "to diligently protect the interests of consumers of gas in Bethnal Green and similar areas."

The Alliance and Dublin Consumers' Gas Company are making extensive additions to their premises in Great Brunswick Street and Cardiff Lane, Dublin. These include large iron buildings for new purifiers. The area covered will be 210 ft. by 156 ft., divided into three bays. Large concrete floors and foundations and preliminary work have been executed under the supervision of the Company. Gibbons Bros., Ltd., of Dudley, are the contractors; and Mr. Harry Dambleton, Works Manager to the Gas Company, is supervising.

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